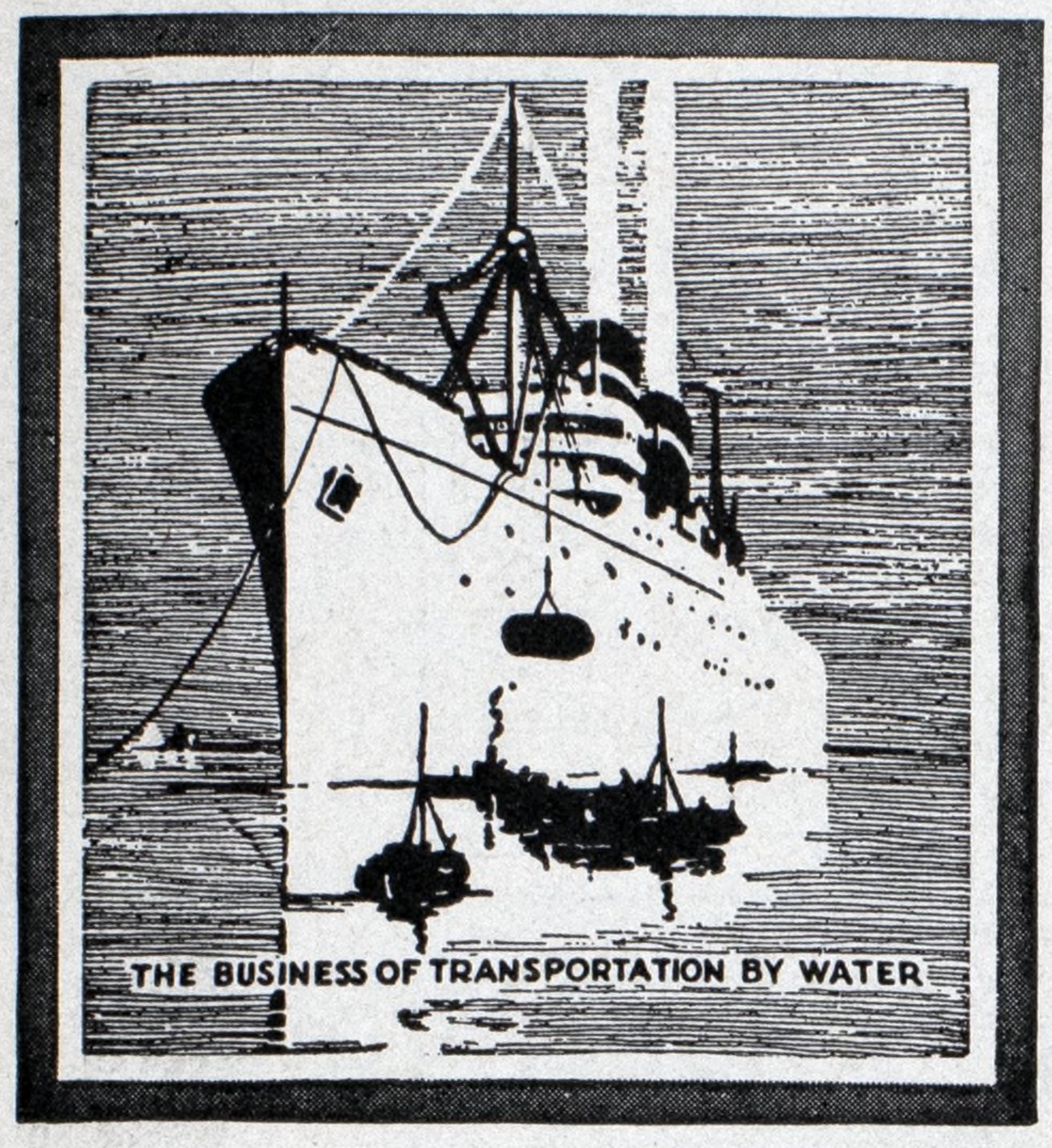
Marine Review

The National Publication Covering the Business of Transportation by Water

CLEVELAND **FOUNDED 1878** **NEW YORK**



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Marine Diesel Engine

Insert section of the

November 1930 Issue

Marine Review

New York London Cleveland

« EDITORIAL »

Why Is American Operator Shy About the Diesel?

APPLICATION of the internal combustion engine for marine propulsion has steadily increased in recent years. In the report of Lloyd's Register of Shipping for the quarter ended Sept. 30, last, vessels equipped with this type of power represented 60 per cent of the total world merchant shipping under construction. The peak of motorship building came in the quarter ending June 30 last, when it represented 63 per cent of world construction. In Great Britain and Ireland 57 per cent of construction is now in motor vessels. In all other foreign countries grouped together it is 63 per cent. Compare this with 20 per cent for the United States!

A careful analysis, however, of all steel merchant type of vessels 100 gross tons and over including coast guard ships, lightships, government river boats, etc., under construction during 1929 in the United States, published in the April issue of MARINE REVIEW, gives a somewhat different aspect to the position of the diesel engine in ship propulsion. This analysis shows (and relatively it will be similar for the year 1930) that of 145 vessels listed, 80 or 55.2 per cent in number were fitted with diesel power. In gross tonnage these motor vessels represented 29.3 per cent and in horsepower 18.5 per cent. The average horsepower per unit was only 878. These figures do not include many ocean going yachts with diesel drive in horsepowers up to 3000.

Smaller Diesel Engines Widely Used

FROM this it is clear that the diesel engine in lesser powers, say from 1200 down, is finding ready acceptance in the United States. It is also equally clear that in larger vessels and powers, the American shipowner is fighting shy of the internal combustion engine. But there are reasons for this which cannot be dismissed by saying that he is not progressive, that he is afraid of something he does not know much about, that he lacks business acumen when it comes to seafaring, or that powerful influences are brought to bear to affect his decision. All of the foregoing would apply to the numerous wealthy Americans who are going in for elaborate ocean yachts and does not seem to have had a deterring effect in the choice of power.

Some factors therefore that have favored steam over diesel in the United States are:

1. The greatly improved fuel economy over that of only a few years ago which can now be guaranteed in a modern steam plant.
2. The almost prohibitive differential in price of diesel engine fuel.
3. Complete standstill of a very important part of our merchant marine program, viz. the replacement and additions to the great fleet of obsolete freighters built over 10 years ago.
4. Lack of confidence in the reliability and low cost of upkeep for larger diesel engines.
5. High first cost of the diesel engine.

The two great advantages of the diesel engine are, its high thermal efficiency and that it is self contained. Due to two of the factors quoted above the first of these advantages under certain circumstances may be entirely eliminated and even reversed. Facing the situation frankly the American diesel engine builder should familiarize himself with all of the operating conditions of the steamship owner. When these conditions are thoroughly analyzed he will be on solid ground.

Performance Data of Larger Engines

WHAT can the diesel engine builder do to get over to the shipowner the superiority of his power? To fully counteract the active whispering campaign, defaming the reliability and hinting at costly upkeep of existing units, he should give all the facts concerning the workaday performance of those units he now has in operation.

There can be no good reason why every log of every trip made by the shipping board diesel ships should not be public. Let them be published in full. Give all the operating data, time at sea, in port, wages, fuel consumption and cost of operation in all details including repairs and replacements. This would clear the air and help to regain the confidence of the operator who now hears this rumor and that, not knowing all the facts but hearing enough to make him uncertain about any good reports.

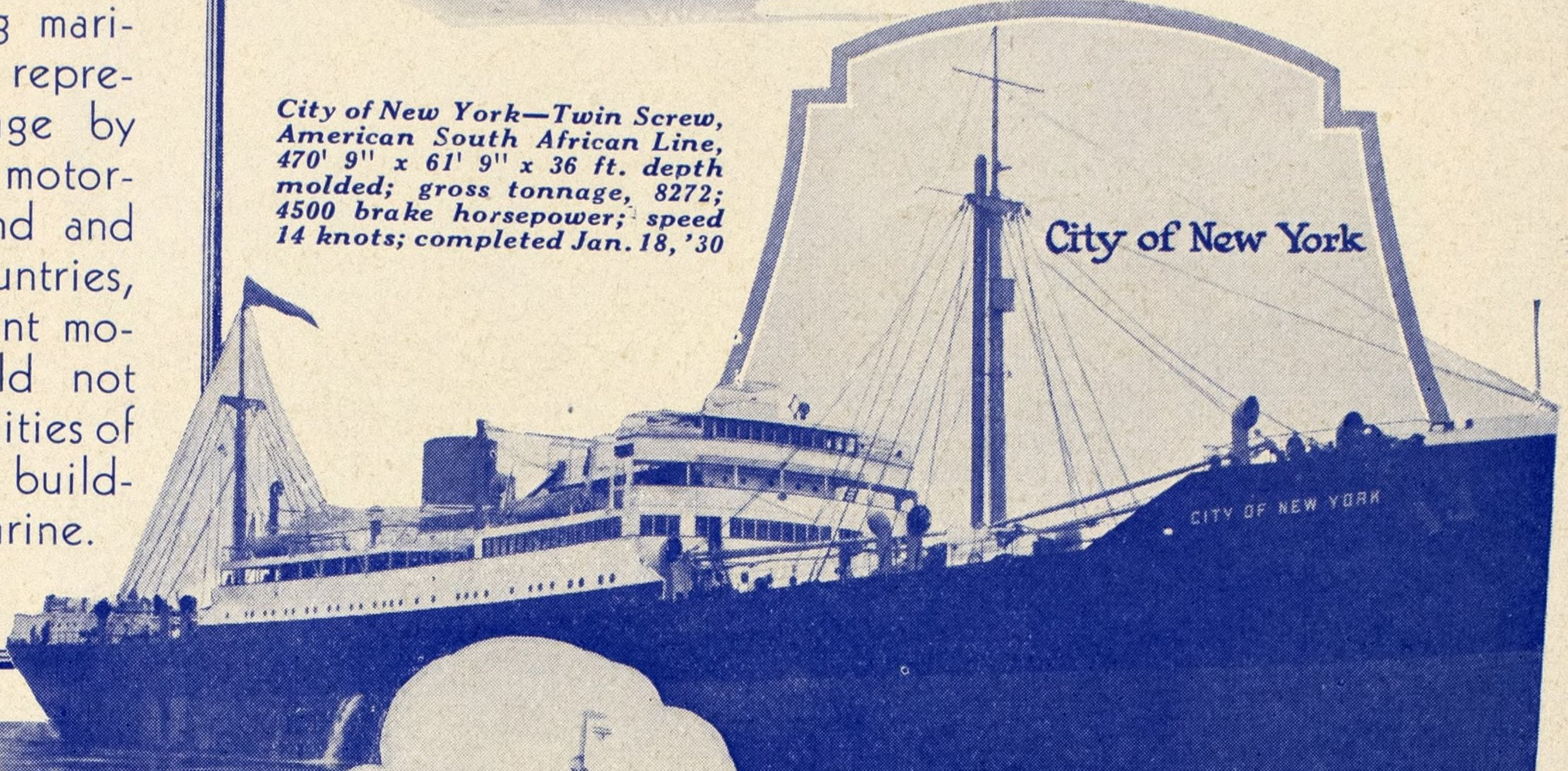
In the following pages 16 different marine diesel engine installations are briefly described and illustrated. These pages show the wide range of application for the diesel engine in American merchant craft.

Britannic

Britannic — Twin-screw White Star liner — New York - Liverpool service; 680 x 82 x 43' 9"; 26,400 gross tons; 20,000 horsepower; between 16 and 17 knots.—Arrived in New York on maiden voyage July 7, 1930

FIVE of the leading maritime nations are represented on this page by recent outstanding motorships. Italy, Holland and the Scandinavian countries, have added important motorships. We should not overlook the possibilities of this type of drive in building our merchant marine.

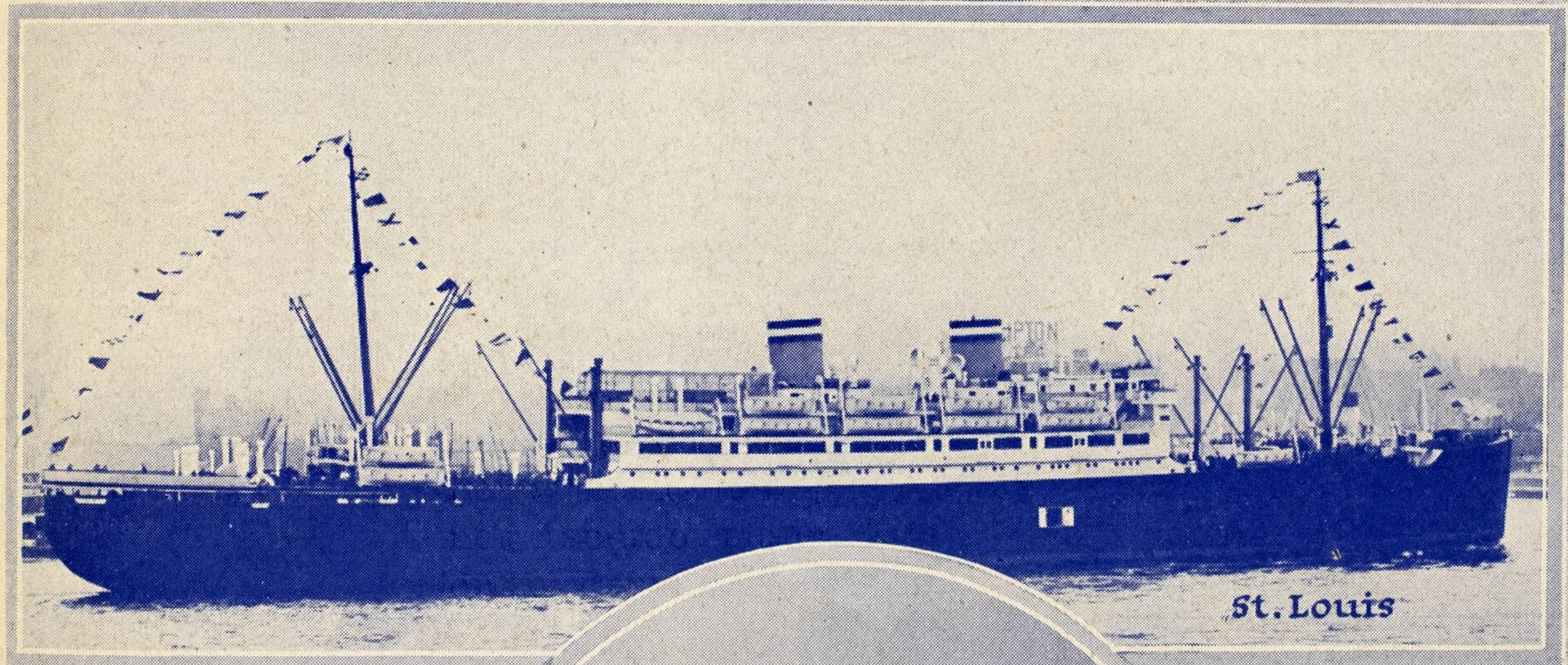
City of New York—Twin Screw, American South African Line, 470' 9" x 61' 9" x 36 ft. depth molded; gross tonnage, 8272; 4500 brake horsepower; speed 14 knots; completed Jan. 18, '30



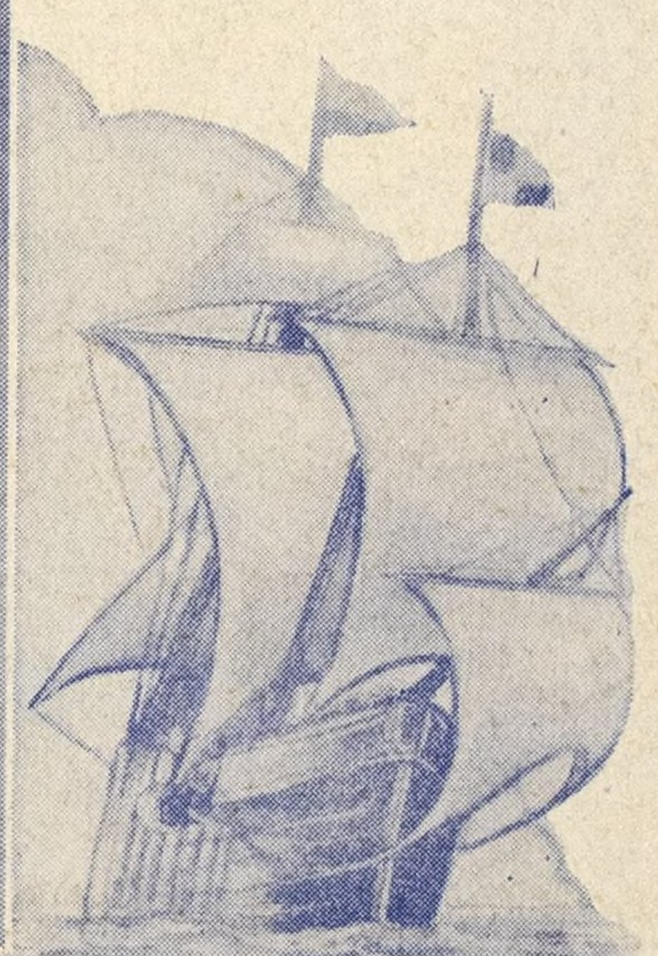
City of New York

Asama Maru — Quadruple screw, passenger and freight — Nippon Yusen Kaisha; Japan to San Francisco; 584' x 72' x 42.5'; 16,800 gross tons; 16,000 horsepower; speed, 21 knots on her trial. Arrived in San Francisco Oct. 21, 1929 on maiden voyage

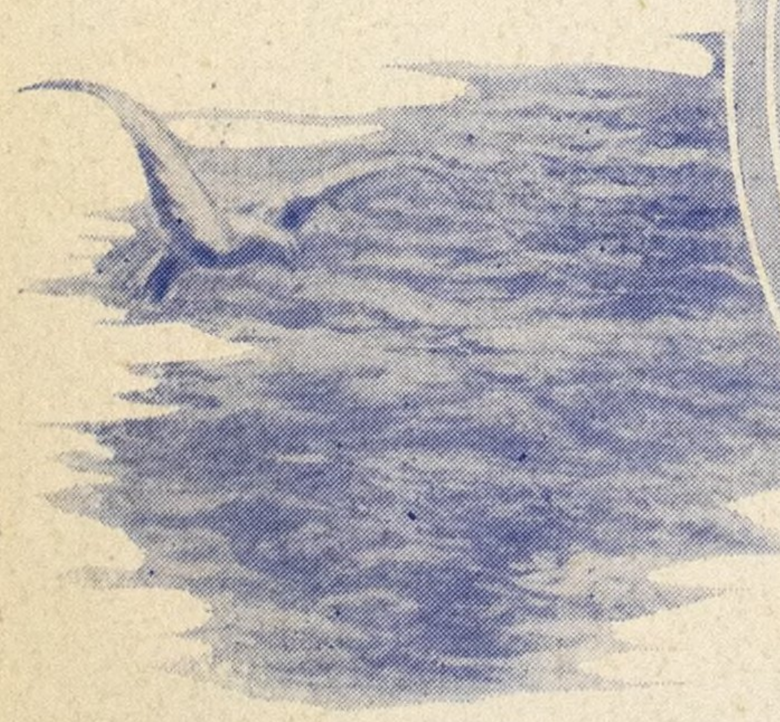
Asama Maru

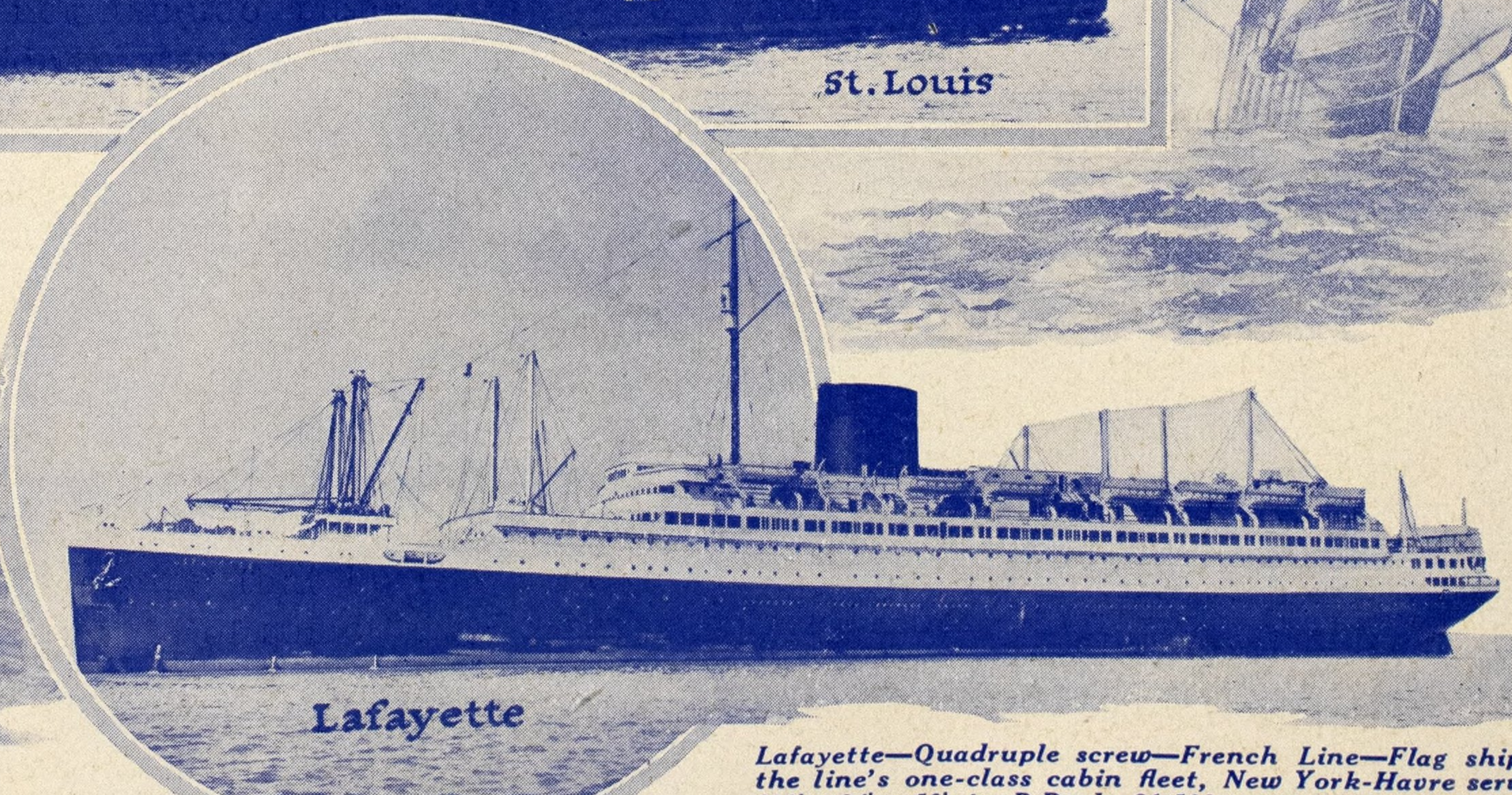


St. Louis



St. Louis—Twin screw, Hamburg-American. Geared diesel machinery; 575' x 73' x 42.1'; 16,732 gross tons; brake horsepower, 12,000; speed 16 knots. Arrived in New York April 9, 1929



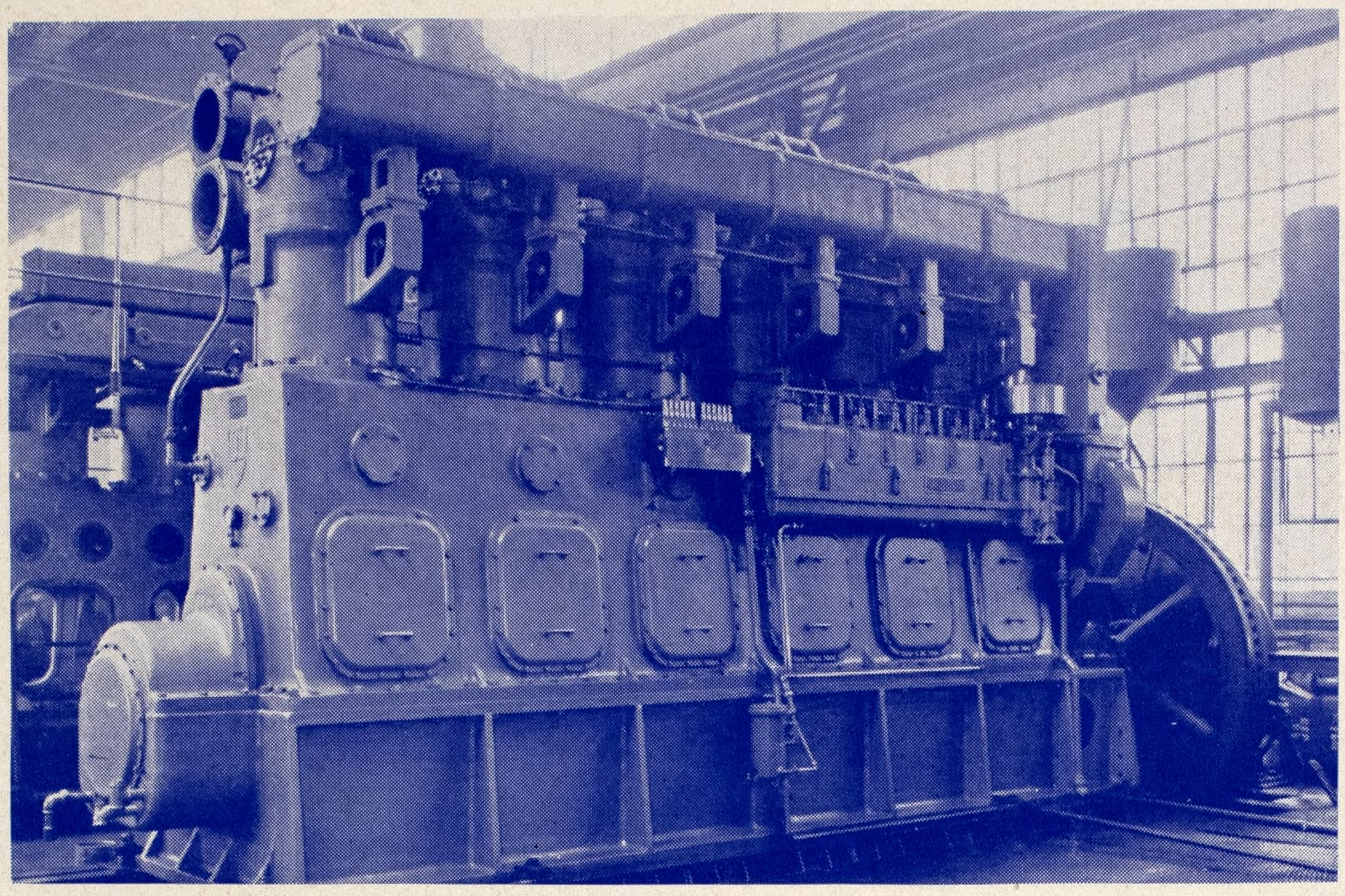


Lafayette

Lafayette—Quadruple screw—French Line—Flag ship of the line's one-class cabin fleet, New York-Havre service; 600' x 84' x 50' to B Deck; 21,500 gross tons; 20,000 horsepower; speed, 18.2 knots. Arrived New York on maiden voyage May 26, 1930

Diesel Electric Drive in Tanker Veedol No. 2

Two Engines—Each 625 B.H.P.



DESCRIPTION

Two six-cylinder non-reversible heavy duty four-cycle, single acting solid injection trunk piston diesel engines of 625 shaft horsepower each at 225 revolutions per minute are direct connected to direct current generators rated at 410 kilowatts each, 250 volts shunt wound. An interesting feature of this type of engine is the silent chain driven camshaft.

Engine

Name of Engine—De La Vergne; **Year**—1930
Builder—I.P. Morris & De La Vergne, Inc.
Cycle—4; **No. of Cyls.**—6; **I.H.P.**—790
B.H.P.—625; **Action**—Single; **Inject.**—Solid
Scavenging—None; **Piston Cooling**—None
Bore—17 in.; **Stroke**—24 in.; **R.P.M.**—225
Piston Speed—900 ft. per min.; **Press. Ind.**—85
Pressure Brake—76.2; **B.H.P. per Cyl.**—104
I.H.P. per Cyl.—132; **Mechanical Eff.**—79%
Stroke to Bore—1.41; **Wkg. Strokes per Rev.**—3
Lgth. O.A.—34 ft. 7¾ in.; **Width**—7 ft. 8 in.
Height Overall—13 ft. 3 in.; **Wt.**—150,000 lbs.
Weight—Lbs. per B.H.P.—240; **Per I.H.P.**—190
Reversing—None; **Air Compressor**—Independent

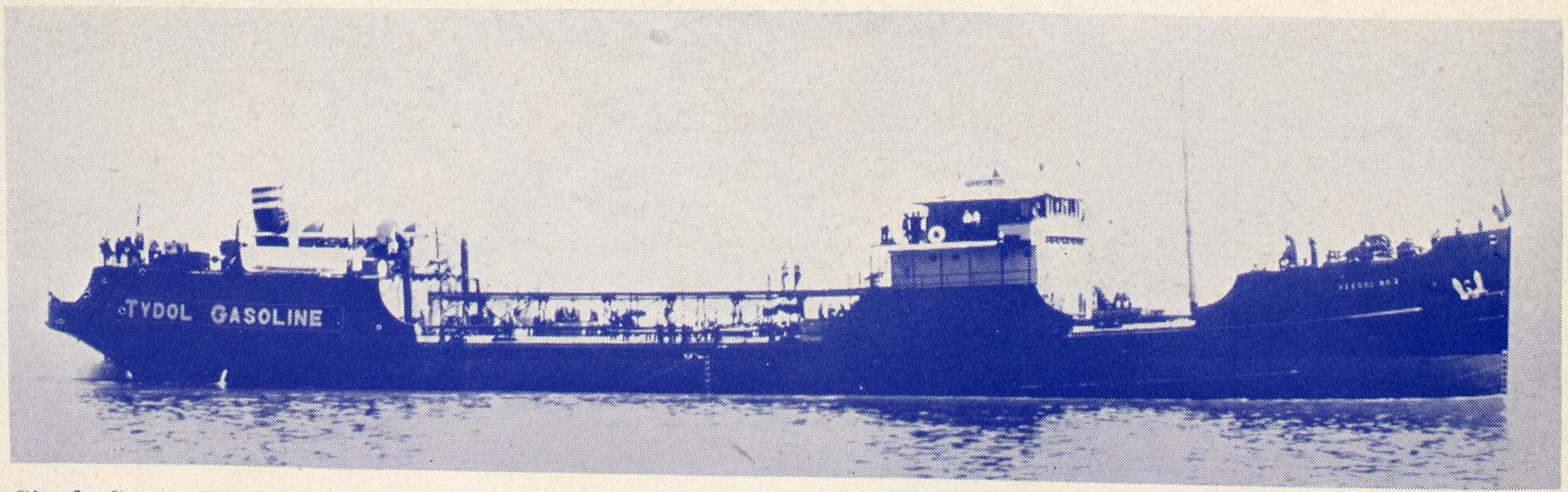
Vessel

Name—Veedol No. 2; **Type**—Oil tanker
Owner—Tidewater Oil Co.; **Builder**—Pusey & Jones
Completed—May, 1930; **Drive**—Diesel electric
Lgth. B.P.—225 ft.; **Bm.**—44 ft.; **Dth.**—18 ft. 6 in.
Draft Loaded—15 ft. 6 in.; **displ.**—3650 tons
Deadweight—2300 tons; **Speed**—10½ knots
Number of Propellers—One
Fuel Consump.—Lbs. per b.h.p. per hour—0.42
Tons Fuel Per Day—5½ at full load
Generators—Main drive, two 410 k.w. at 225 r.p.m. each driven by engine described above
Propulsion Motor—Direct current 1000 horsepower at 130 r.p.m. Connected to propeller
Auxiliary Generator—One 45 k.w. at 350 revolutions 240 v. driven by 100 h.p. Winton diesel
All electrical machinery made by General Electric Co.

Remarks

This tanker is a sister ship of the Tidewater. The main generators, of direct current, each carries on an extension of the shaft a 45-kilowatt exciter at 240 volts.

The vessel is a clean oil tanker and is electrically equipped throughout including galley and radiators in living quarters. Cargo capacity is about 935,000 gallons. The intended service of the vessel is between Bayonne, N. J. and ports from Norfolk, Va. to Portland, Me.



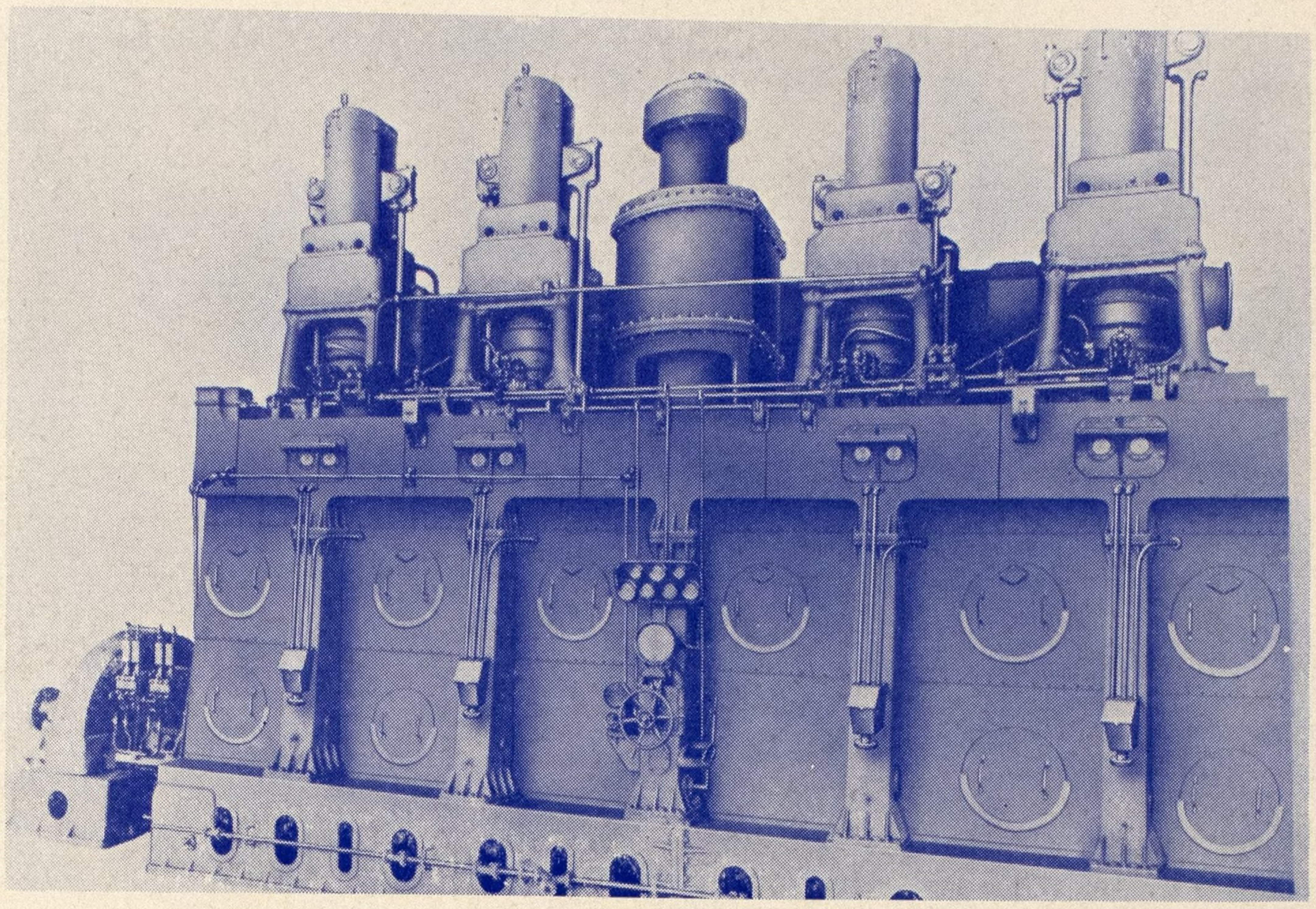
Single Screw Diesel Electric Tanker Veedol No. 2—Two 625 B. H. P. De La Vergne Engines—General Electric

Diesel Direct Drive in Tanker Tide Water

One Engine—2800 B.H.P.

DESCRIPTION

One of these engines, of opposed piston type, is direct connected to a single propeller in the 13,735 deadweight tons tanker Tide Water. The engine is of 4-cylinder, 2-cycle solid injection Sun-Doxford type. It is a direct reversible engine with long stroke slow speed and of heavy duty crosshead type with medium compression. The combined stroke is 91 1/3 inches, and 2800 horsepower is developed at 80 revolutions per minute. The attached scavenging pump is located between cylinders 2 and 3.



Engine

Name of Engine—Sun-Doxford; **Year**—1930
Builder—Sun Shipbuilding & Dry Dock Co.
Cycle—2; **No. of Cylinders**—4; **I.H.P.**—3256
B.H.P.—2800; **Action**—Single; **Injection**—Solid
Scavenging—Attach; **Piston Coolg.**—Fresh Water
Bore—23⅝ in.; **Stroke**—91 1/3 in.; **R.P.M.**—80
Piston Speed—609 ft. p.m.; **Pres. Indicated**—95
Pressure Brake—81.7; **B.H.P. per Cyl.**—700
I.H.P. per Cylinder—814; **Mechanical Eff.**—86%
Stroke to Bore—3.87; **Wkg. Str. per Rev.**—one
Lgth. O.A.—56 ft. 2 in.; **Hght. O.A.**—32 ft. 1 in.
Width Overall—13 ft. 5 in.; **Reversing**—Direct
Weight—780,000 lbs.; **Per B.H.P.**—278 lbs.
Air Compressors—Two, one electric motor-driven 90 c.f.m. and one, steam-driven 150 c.f.m.

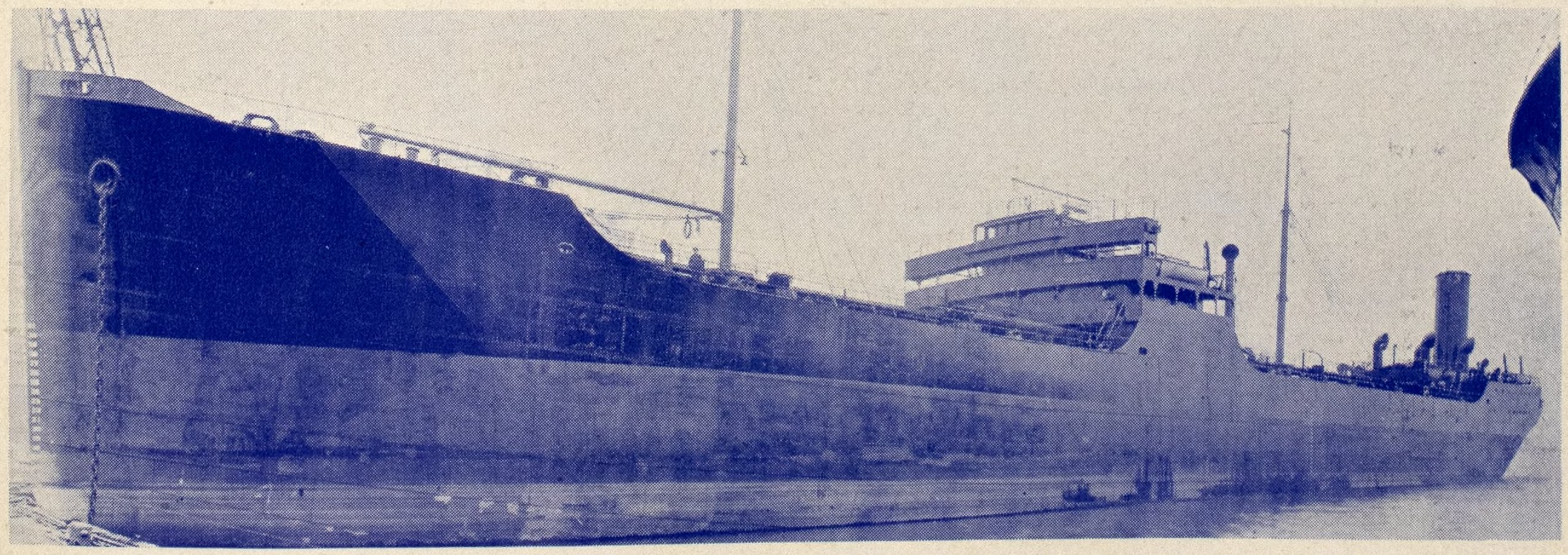
Vessel

Name—Tide Water; **Builder**—Sun S.B. & D.D. Co.
Type—Single screw ocean going oil tanker
Main Drive—One diesel engine direct connected
Length B.P.—480 ft.; **Beam**—65 ft. 9 in.
Depth—37 ft.; **Draft**—27 ft. 8 7/16 in.
Displ.—19,308 tons; **Deadweight**—13,735 tons
Speed in Knots—11; **No. of Propellers**—One
Fuel Capacity—7767 barrels, or 1100 tons
Fuel Consumption—Lb. per b.h.p. per hr.—0.41 Lb. i.h.p. per hr.—0.357; tons a day—12.3
Radius Without Refueling—14,300 naut. miles
Generators—Two of 75 k.w. each at 325 r.p.m. General Electric, direct driven by Winton diesel 10 x 14 inches, 4 cyls., 120 b.h.p. each

Remarks

This tanker is one of a large fleet of sister motor ships that have been built during the last two years by the Sun Shipbuilding & D. D. Co. She is constructed on the Isherwood bracketless system.

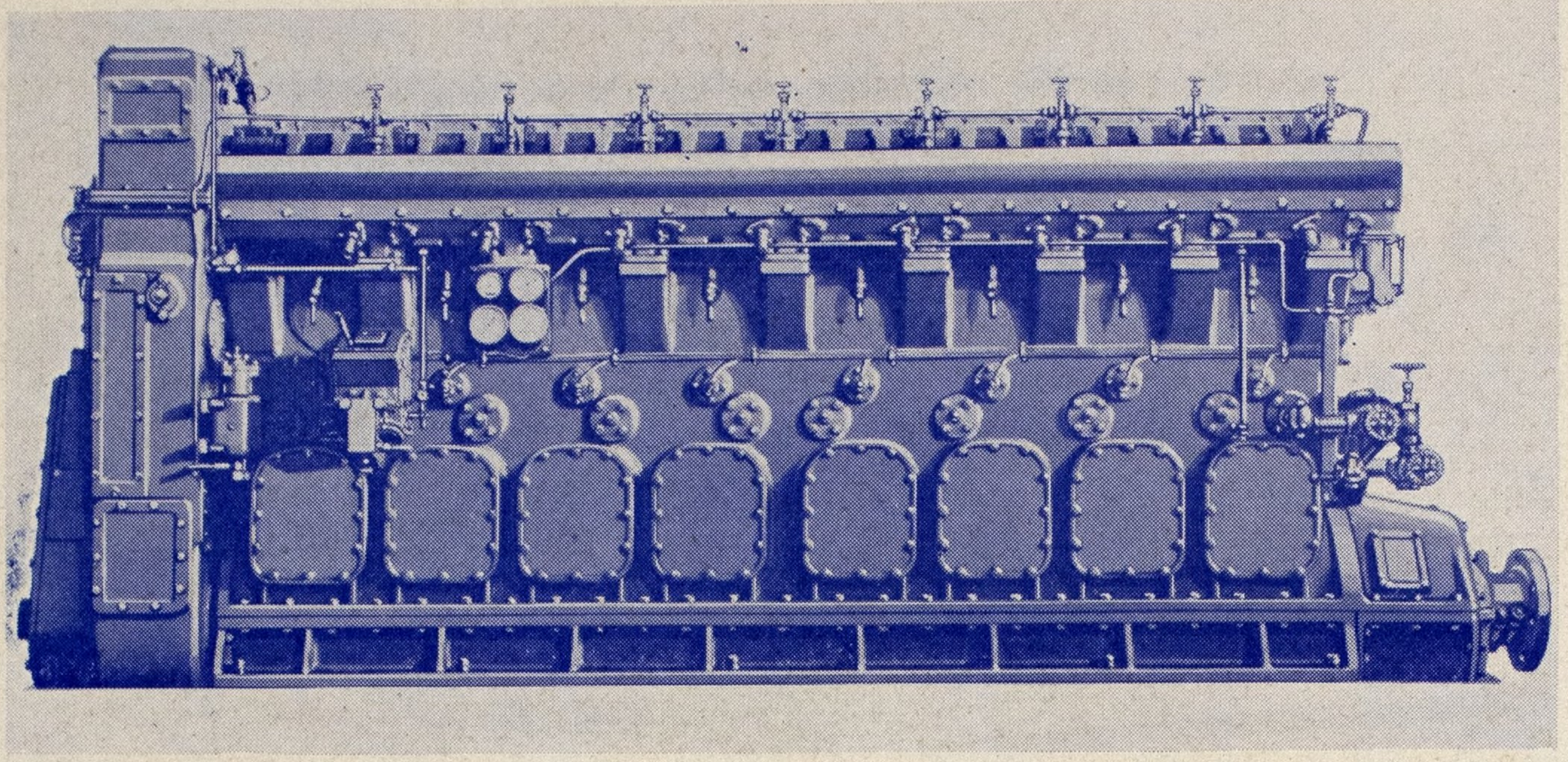
The Sun-Doxford oil engine is reversed by a hand operated sliding camshaft. The attached scavenging pump is driven from the engine crankshaft. Piston cooling is accomplished through a closed system by pumping fresh water from sump and discharging through a cooler to the engine.



Single Screw Ocean Going Oil Tanker Tide Water Main Drive One 2800 B. H. P. Sun-Doxford Diesel Engine

Diesel Direct Drive in Tanker Raritan Sun

One Engine—300 B.H.P.



DESCRIPTION

A low powered self-propelled tanker for river and coastwise service. A single propeller is direct connected to one four-cycle, eight-cylinder, solid injection diesel engine. This engine has a heavy open flywheel and a separate Kingsbury thrust. The heavy flywheel permits turning the engine at 70 revolutions in canals, which is about as slow as necessary.

Engine

Name of Engine—Cooper-Bessemer; **Year**—1930
Builder—The Cooper-Bessemer Corp.; **Cycle**—4
No. of Cyls.—8; **B.H.P.**—300; **I.H.P.**—353
Action—Single acting; **Injection**—Mech. Solid
Piston Coolg.—No; **Bore**—11 in.; **Stroke**—14 in.
R.P.M.—260; **Piston Speed**—607 feet per min.
Pressure Brake—85; **B.H.P. per Cylinder**—37.5
I.H.P. per Cylinder—44.1; **Mechanical Eff.**—85%
Stroke to Bore—1.27; **Wkg. Strs. Per Rev.**—4
Lgth. O.A.—15 ft. 8¾ in.; **Hgt.**—7 ft. 2 5/32 in.
Width O.A.—4 ft. 2 in.; **Wt. Eng.**—44,000 lbs.
Reversing—Direct reversible
Air Compressor—10 h.p. motor drive, 25 cu. ft.

Vessel

Name—Raritan Sun; **Owner**—Sun Oil Co.
Builder—Sun Shipbuilding & Dry Dock Co.
Type—Single screw tanker; **Completed**—1930
Main Drive—One diesel engine direct connected
Length B.P.—188 ft. 6 in.; **Depth**—11 ft. 6 in.
Draft—9 feet; **Displacement**—1161 tons
Deadweight—733 tons; **Speed**—9 knots

No. of Propellers—One; **Fuel Cap.**—120 barrels
Fuel Consumption—Lb. per b.h.p. per hr.—0.44
Generators—Two sets of 20 k.w. @ 450 r.p.m. and 5 k.w. @ 720 r.p.m. The 20 k.w. set, Junkers diesel drive; the 5 k.w. set Hill diesel drive.

Remarks

A large number of small tankers suitable for river and coastwise service have been built during the last two or three years and the end is not yet. These self-propelled shallow draft tankers are now an important connecting link in the great transportation system which serves in the distribution of petroleum products. It is the economical way to deliver these products to storage tanks serving communities located on tirewater and rivers, canals and lakes accessible from the ocean.

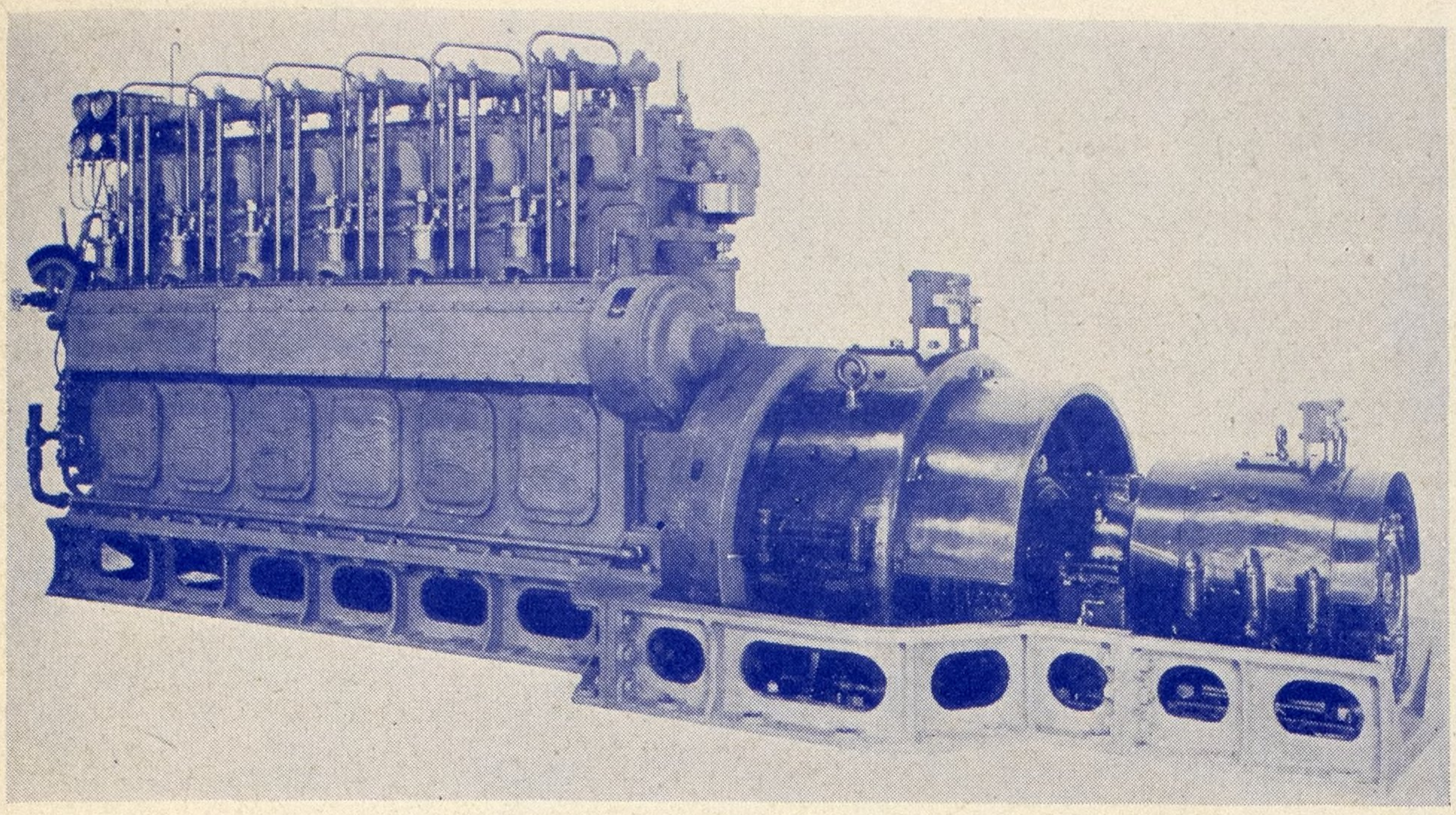
The particular suitability of diesel direct and diesel electric drive for this type of vessel is indicated by the infrequent use of any other type of machinery for this purpose in recent times.

The largest diesel engine built for marine service by the Cooper-Bessemer Corp. is eight-cylinder, 18 x 22 inches, 1240 horsepower at 257 revolutions per minute. It is of trunk piston type, four cycle, single acting and solid injection.

Single Screw Diesel Tanker Raritan Sun—Built by Sun Shipbuilding & Drydock Co.—Cooper-Bessemer Engine

Diesel Electric Drive in Ferryboat Chelsea

Two Engines—Each 200 B.H.P.



DESCRIPTION

Propulsive power is furnished to one 300 horsepower, 500 volts, direct current electric motor by two diesel engine driven generating sets. Each generator of 125 kilowatts, 250 volts, direct current, with direct connected exciter of 15 kilowatts, 125 volts, is driven by a four-cycle, six-cylinder 200 brake horsepower diesel engine described on this page.

Engine

Name of Engine—Nelseco; **Year**—1930
Builder—Electric Boat Co.; N.L.S. & E. Works
Cycle—4; **No. of Cylinders**—6; **I.H.P.**—250
B.H.P.—200; **Action**—Single; **Injection**—Solid
Piston Coolg.—No; **Bore**—10½ in.; **Str.**—15 in.
R.P.M.—300; **Piston Speed**—750 feet per min.
Pressure Indicated—84.8; **Pressure Brake**—67.6
B.H.P. per Cyl.—33.3; **I.H.P. per Cyl.**—41.6
Mechanical Eff.—80%; **Stroke to Bore**—1.43
Wkg. Strokes per Rev.—1 stroke per 2 rev.
Lgth. O.A.—12 ft. 11¾ in.; **Wth.**—4 ft. 13/16 in.
Height O.A.—7 ft. 7 11/16 in. above C.L. of shaft
Weight—One engine, 27,800 pounds
Weight—Lbs. per B.H.P.—139; **Per I.H.P.**—110 lbs.
Reversing—Direct reversible; **Air Comp.**—None

Vessel

Name—Chelsea; **Type**—Steel screw ferryboat
Owner—Dept. Plant and Structures, New York City
Builder—Todd D.D. Engineering & Repair Co.
Completed—June 30, '30; **Drive**—Diesel electric
Length—Over Guards, 101′ 6″; **Beam**—o.g. 30 ft.
Depth—11 ft. 11½ in.; **Draft**—7 ft. 3 in.
Displacement—259 tons; **No. of Propellers**—Two
Fuel Consump.—Lbs. per b.h.p. per hour—0.42
Generators—Two main propulsion generator sets of 125 k.w. at 300 r.p.m. each driven by one Nelseco engine described above.
Propulsion Motor—One 300 horsepower d.c. 500 v. at 250 r.p.m. Main generators and propelling motor furnished by Electro Dynamic Co.

Remarks

This ferryboat represents an ideal small power main propulsion unit. The diesel engines operating the generators have practically stationary service. With electric current available the operation of the propulsion motor starting, stopping, slowing down and speeding up is as simply accomplished as running an electric elevator. In this way perfect control is given to the pilot in the operation of the vessel.

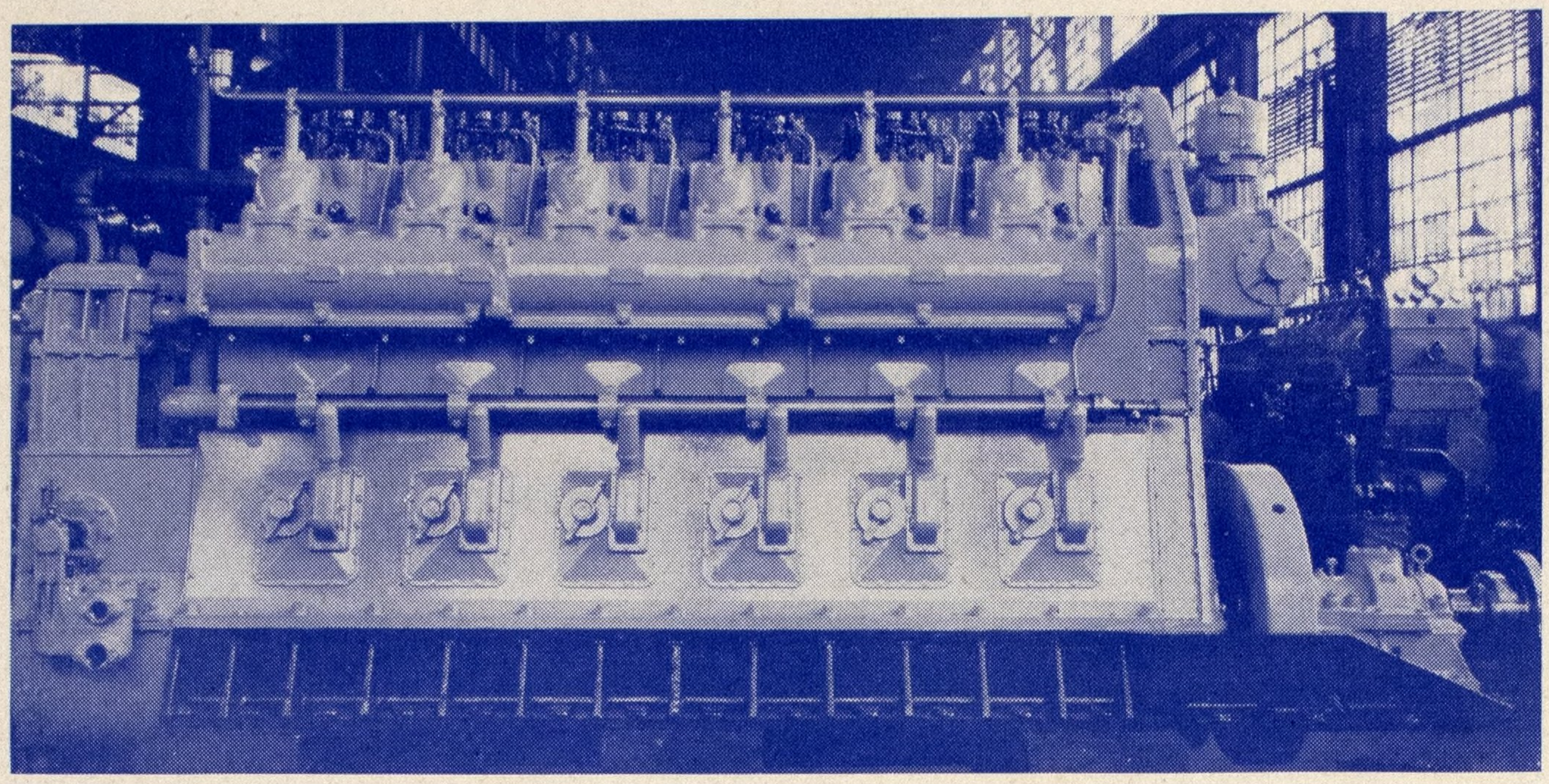
The ferryboat CHELSEA is a fine modern little vessel in every respect and operates out of One Hundred and Thirty-fifth street, Harlem river, New York city, carrying passengers and automobiles.

Flexibility in operation is important in the crowded waters through which this vessel plies.

Diesel Electric Steel Screw Ferry Chelsea—Two Nelseco Diesel Engines of 200 B. H. P. Each Driving Generators—One 300 H. P. Motor

Diesel Direct Drive in Tanker Irene W. Allen

Two Engines—Each 330 B.H.P.



DESCRIPTION

Two of these engines each direct connected to a propeller serve as the main drive for this tanker. The engines are six-cylinder, four-cycle, single acting solid injection diesels developing 330 horsepower each at 330 revolutions per minute. The cylinder block is made of chrome nickel iron in one piece flanged and bolted to top crankcase. Nickel iron cylinder liners are inserted into casting.

Engine

Name of Engine—Winton; **Year**—1930
Builder—Winton Engine Corp.; **Cycle**—4
No. of Cylinders—6; **B.H.P.**—330
Action—Single; **Injection**—Solid (Airless)
Piston Coolg.—No; **Bore**—12½″; **Stroke**—16″
R.P.M.—330; **Piston Speed**—880 feet per min.
Pressure Brake—67.2; **B.H.P. per Cyl.**—55
Stroke to Bore—1.33; **Wkg. Strokes per Rev.**—3
Lgth. O.A.—17 ft. 2 in.; **Width O.A.**—5′ ⅞″
Height—Base to top of engine—8 ft. 3⅞ in.
Weight—Each engine complete, 45,300 pounds
Weight—Pounds per b.h.p. one unit, 137
Reversing—Direct; **Air Comp.**—Independent—5 h.p.

Vessel

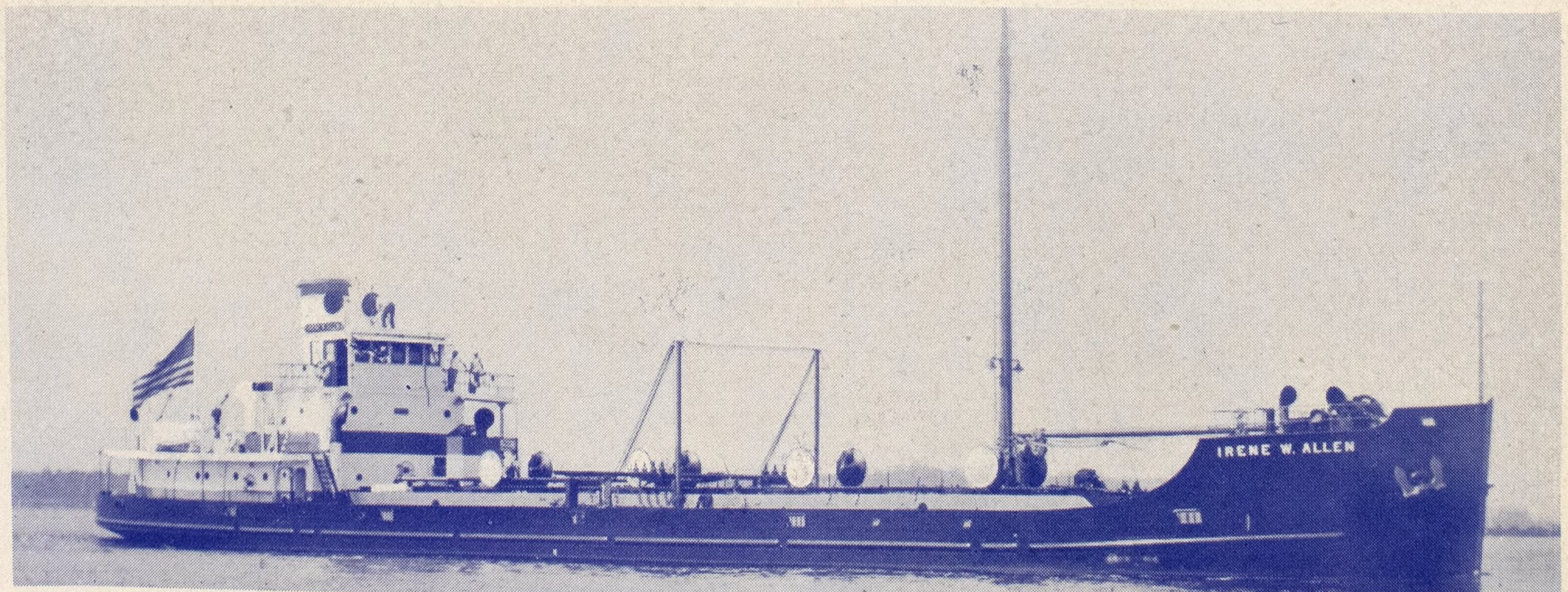
Name—Irene W. Allen; **Type**—Coastwise tanker
Owner—Lake Tankers Corp.
Builder—Bethlehem S. B. Corp., Sparrows Point,
Completed—1930; **Length O.A.**—209 feet
Beam—38 feet; **Draft**—11 ft. 6 inches loaded
Cargo Capacity—10,000 barrels of gasoline
Fuel Consump.—Lbs. per b.h.p. per hour—0.45
Generators—Two, each of 50 kilowatts capacity, 600 revolutions per minute, General Electric. Direct connected to Winton diesel engines

Remarks

The Irene W. Allen and sister ship Justine C. Allen are both equipped with two 6-cylinder Winton diesel engines, each developing 330 horsepower at 330 revolutions per minute. These two twin screw diesel tankers each of 870 gross tons and a capacity of 10,000 barrels were built at the Sparrows Point plant of the Bethlehem Shipbuilding Corp. for the Lake Tankers Corp.

The same owner also has received delivery on three twin screw diesel electric tankers of 6000 barrels capacity each, built at the Fore River plant of the Bethlehem Shipbuilding Corp. The names of these three are: L.T.C. 1; L.T.C. 2 and L.T.C. 3. They are 201 feet 7 inches in length overall, 32 feet in molded beam, 11 feet 6 inches in molded depth, operate on a draft of nine feet, and were built for use on the Hudson river and New York State barge canal. These three are also fitted with Winton diesel engines connected to 210 kilowatt generators and 20 kilowatt exciters. The electrical end is supplied by General Electric Co.

In addition to the above the Lake Tankers Corp. is also having built at the Sparrows Point plant of the Bethlehem Shipbuilding Corp. three tow barges of 10,000 barrels capacity each and one twin screw steam driven tanker of 2500 barrels capacity.



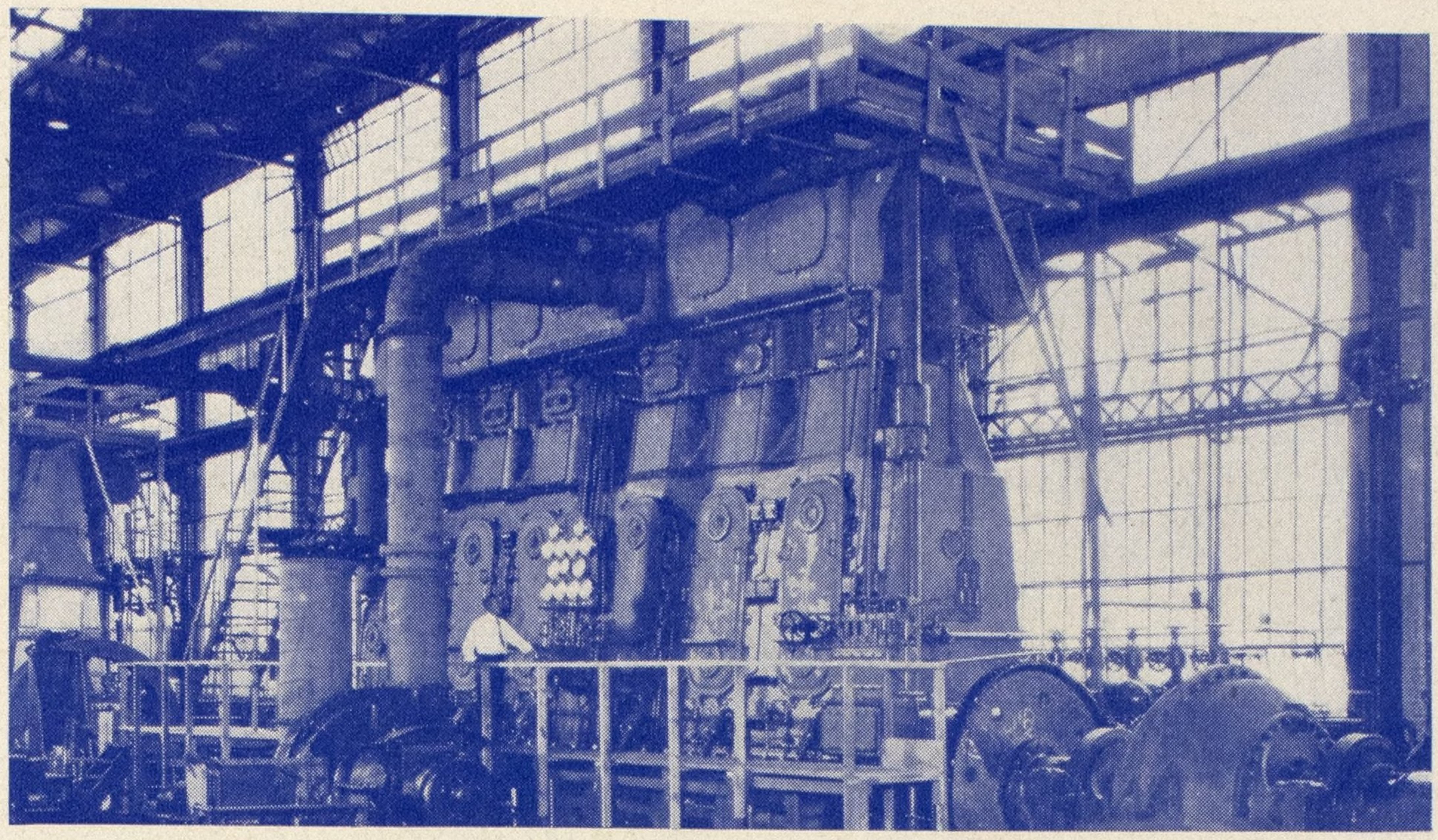
Diesel Tanker Irene W. Allen—Built at Sparrows Point—Fitted with Two 330-Horsepower Winton Engines

Diesel Direct Drive in Freighter City of Elwood

One Single Acting Engine—4000 B.H.P.

DESCRIPTION

A standard heavy duty single acting two-cycle, crosshead type of the same general design as the Sulzer marine diesel engines. A similar engine was installed in the sister vessel WARD. Both ships were completed over a year ago and are in the service of the Roosevelt Steamship Co. in the New York to India trade. The long runs of this service are especially suited to the diesel drive.



Engine

Name of Engine—Busch-Sulzer; **Year**—1929
Builder—Busch Sulzer Bros. Diesel Engine Co.
Cycle—2; **No. of Cylinders**—6; **B.H.P.**—4000
Action—Single acting; **Injection**—Air
Scavenging—Dble. port, with motor-driven blower
Piston Coolg.—Sea Water; **Bore**—30"; **Stroke**—52"
R.P.M.—104; **Piston Speed**—901.3 ft. per minute
Pressure Brake—69; **B.H.P. per Cyl.**—667
Wkg. Strokes per Rev.—6; **L.O.A.**—42 ft. 3¾ in.
Height Above Centerline of Shaft—25 ft. 3½ in.
Width O.A.—12 ft. 6 in.; **Stroke to Bore**—1.733
Weight—810,000 lbs.; **Per B.H.P.**—202.5 lbs.
Reversing—Direct 3-stage, integral with engine

Vessel

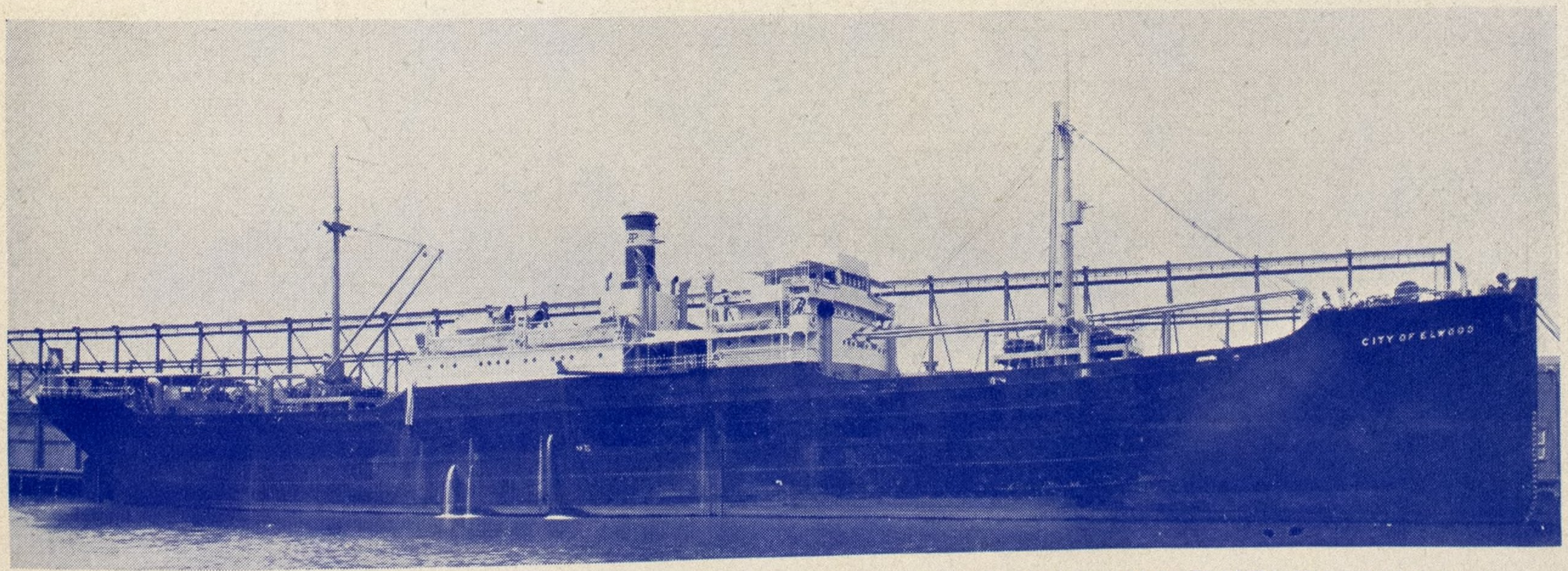
Name—City of Elwood; **Sister Ship**—Ward
Owner—U. S. Shipping Board; **Type**—Freighter
Builder—Converted by Newport News S.B. & D.D. Co.
Completed—June 11, 1929; **Main Drive**—Direct diesel
Lgth. B.P.—395 ft. 6 in.; **Lgth. O.A.**—411 ft. 9 in.
Beam—55 ft. 0 in.; **Depth**—34 ft. 11 in.
Draft—27 ft. ¼ in.; **Speed**—13 knots
Ddwght.—9400 tons; **Displacement**—13,441 tons
Fuel Per Day before Conversion—35 tons
Fuel Per Day after Conversion—18.94 tons
Fuel Consumption—Lbs. per b.h.p. hr.—0.405
Generators—Two by Ellicott Co., 340 k.w. each; Direct driven by Nordberg diesel engines of 500 b.h.p.

Remarks

The motorship CITY OF ELWOOD and her sister ship the WARD were both converted to diesel drive at the Newport News Shipbuilding & Dry Dock Co. The CITY OF ELWOOD was completed June 11, 1929 and the WARD was delivered July 29, 1929. Both vessels have therefore been in operation well over a year.

Summary from the log of the maiden voyage of the CITY OF ELWOOD gives: Total time of voyage 193 days 1 hour; time running, 102 days 5 hours; time in port, 90 days 20 hours; average speed, 12.26 knots; detention at sea, none; detention New York harbor, 1 hour 46 minutes (due to muffler stop valve sticking); detention in Baltimore harbor, 1 hour 12 minutes (due to first stage air compressor having been assembled incorrectly.)

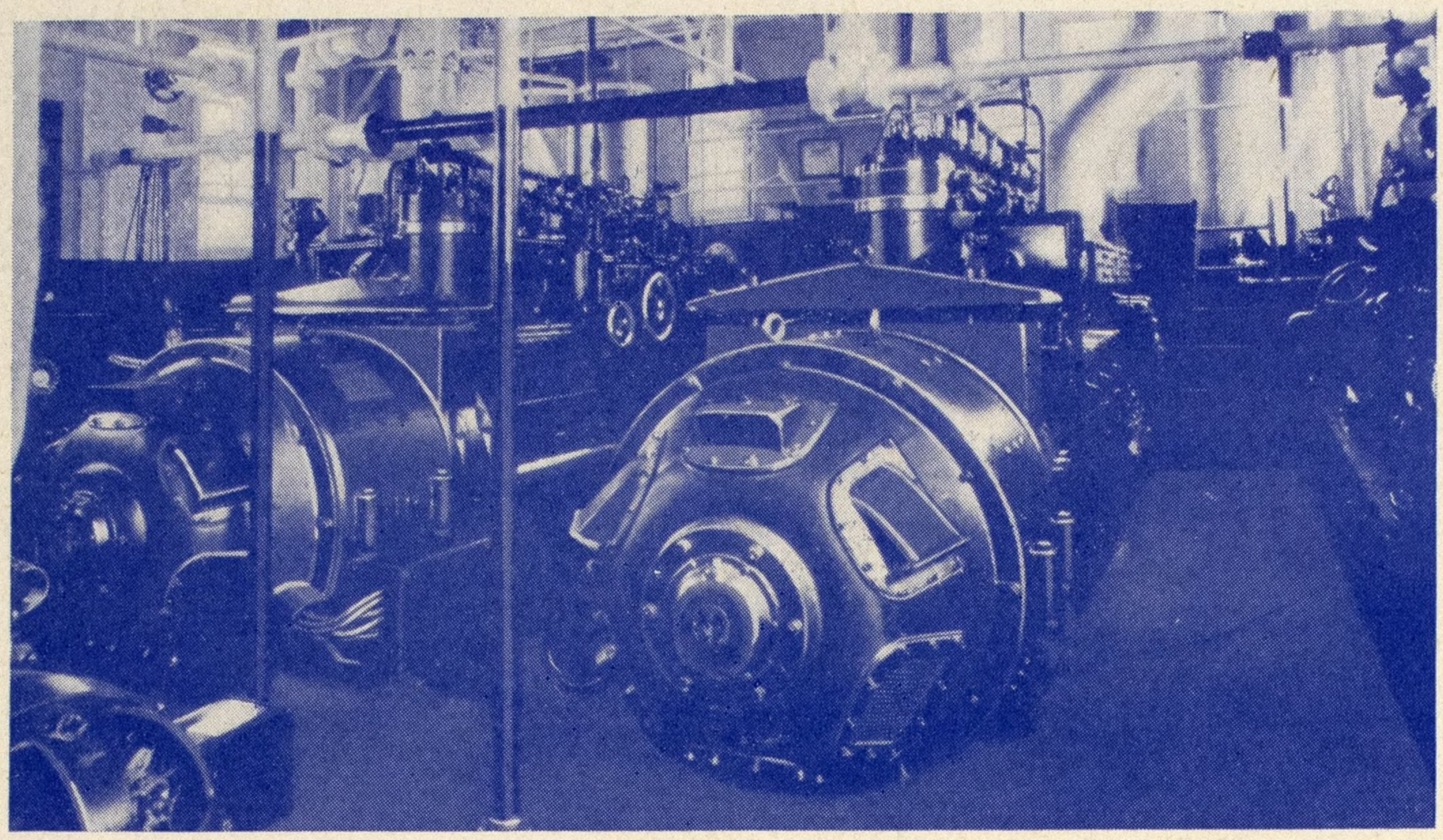
Complete service records of the CITY OF ELWOOD and the WARD during the past year is available, we believe, at the office of the United States shipping board, Capt. J. E. Bailey, in charge, 45 Broadway, or from the Roosevelt Steamship Co., Inc., 11 Broadway, New York city, Paul R. Smith.



M. S. City of Elwood—Fitted With One Single Acting Busch Sulzer 4000 B.H.P. Diesel Engine

Diesel Electric Drive in Towboat Tennessee

Two Engines—Each 150 B.H.P.



DESCRIPTION

This vessel is propelled by two electric motors each driving one section of the split sternwheel by means of double roller chains. Electric current for the motors is generated by two diesel generator sets, each of 100 kilowatt d.c. capacity and with a 10 k.w. exciter attached. The engines are of six cylinders of marine diesel type as described below.

Engine

Name of Engine—Fairbanks-Morse; **Year**—1930
Builder—Fairbanks, Morse & Co.; **Cycle**—Two
No. of Cyls.—6; **B.H.P.**—150; **Action**—Single
Injection—Solid; **Scavenging**—Crankcase
Piston Coolg.—No; **Bore**—8¾"; **Stroke**—10½"
R.P.M.—400; **Piston Speed**—700 feet per minute
B.H.P. per Cyl.—25; **Stroke to Bore**—1.2
Wkg. Strokes per Rev.—6; **Hgt. O. A.**—6 ft. 7 in.
Lgth. O. A.—16 ft. 8½ in.; **Width**—4 ft. 8 in.
Weight—24,500 lbs.; **Lbs. per B.H.P.**—160
Reversing—No, direct connected to generator

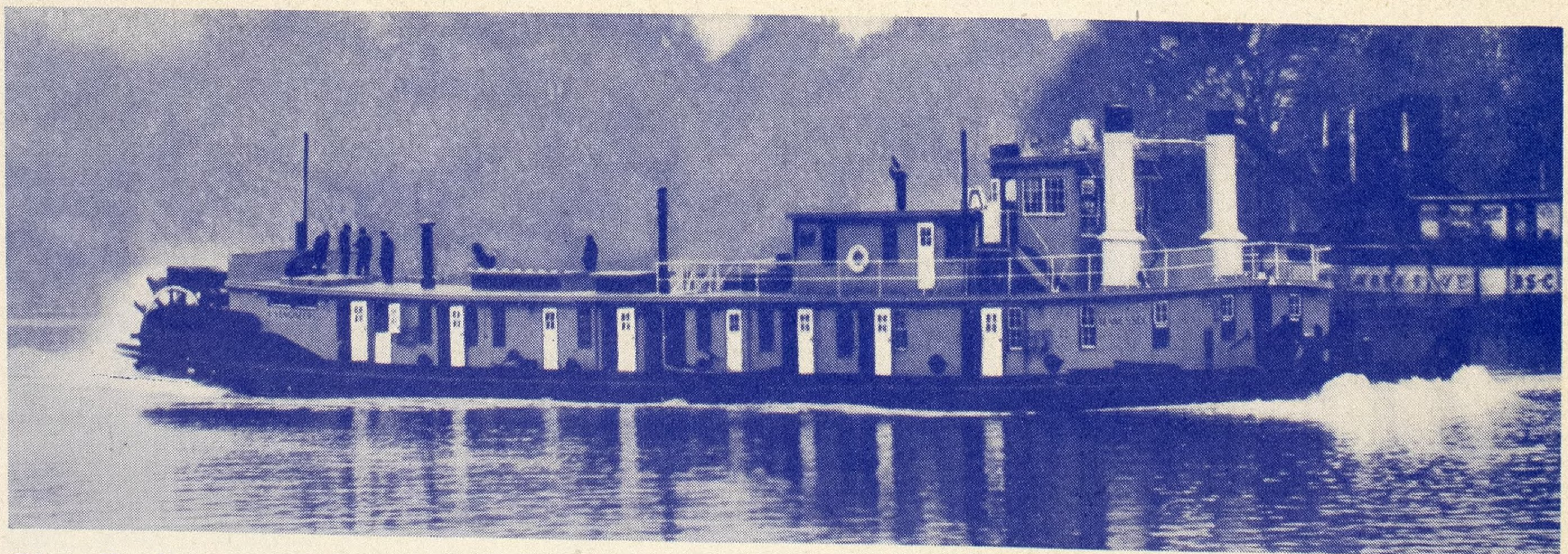
Vessel

Name—Tennessee; **Type**—Sternwheel towboat
Owner—U. S. Engineers, Chattanooga, Tenn.
Builder—Marietta Mfg. Co., Point Pleasant, W. Va.
Completed—Delivered May 5, 1930
Main Drive—Diesel electric; divided sternwheel
Length Molded—140 ft.; **Beam Molded**—29 feet
Depth—5 ft. at center; **Sternwheel**—Two sections
Fuel Capacity—In bunkers, 2000 gallons
Fuel Consumption—Lbs. per b.h.p. per hr.—0.54
Main Generators—Two of 100 k.w. at 400 r.p.m. each direct connected to the diesel engine described above, direct current 10 k.w. exciters
Propulsion Motors—Two direct current shunt wound at 115 h.p. each. Each motor drives one section of the split sternwheel by silent chains.
All electric equipment, Fairbanks-Morse

Remarks

The TENNESSEE is a steel hull river towboat built on the transverse system of framing forward and longitudinal framing aft. Both of the diesel engine generating sets are mounted on an extended sub-base serving as the foundation for the engine, the generator and the exciter.

This vessel is one of the latest developments in the application of the diesel electric drive to a split sternwheel. The diesel engines driving the generators are controlled from the engineer's stand. All other controls are at the pilot stand in the pilothouse. Her performance during trial runs was satisfactory in every respect and exceeded her requirements. Flexibility in maneuvering was particularly noticeable. Either or both halves of the sternwheel may be operated as long as one engine and generator are in service. Exhaustive tests are to be made by the United States Engineers to obtain data of value in sternwheel towboat design.



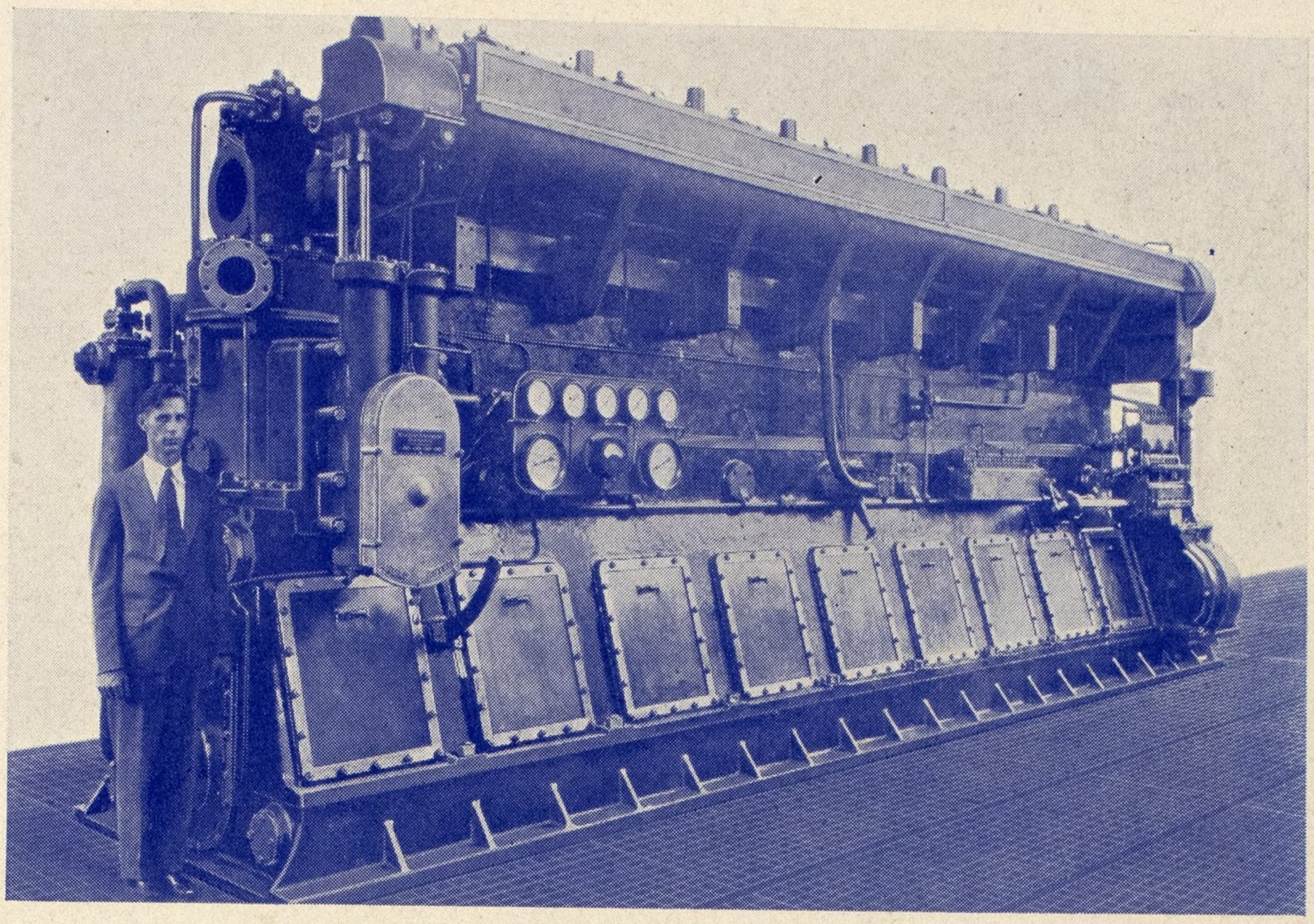
River Towboat Tennessee—Diesel Electric Stern Wheel—Two 150 B. H. P. Fairbanks, Morse Diesel Drive Generators—Two Motors

Diesel Direct Drive in Towboat Herbert Hoover

Two Engines—Each 1100 B.H.P.

DESCRIPTION

Two engines like the one illustrated and described here are to be installed each direct connected to propeller working in a tunnel. Each engine will develop 1100 brake horsepower at 200 revolutions per minute. The control and reversing of each engine is centralized at one point. This helps in maneuvering the boat. Control levers are so interlocked that a false operation is impossible.



Engine

Name—McIntosh & Seymour; **Year**—1930
Builder—McIntosh & Seymour Corp.
Cycle—Four; **No. of Cyls.**—8; **B.H.P.**—1100
Action—Single; **Injection**—Air; **No scavenging**
Piston Coolg.—Oil cooling; **Bore**—20 inches
Stroke—24 inches; **R.P.M.**—200
Pist. Spd.—800 f.p.m.; **B.H.P. per Cyl.**—137.5
Stroke to Bore—1.2; **Wkg. Strokes per Rev.**—4
Reversing—Air; **Air Compressor**—Three stage

Vessel

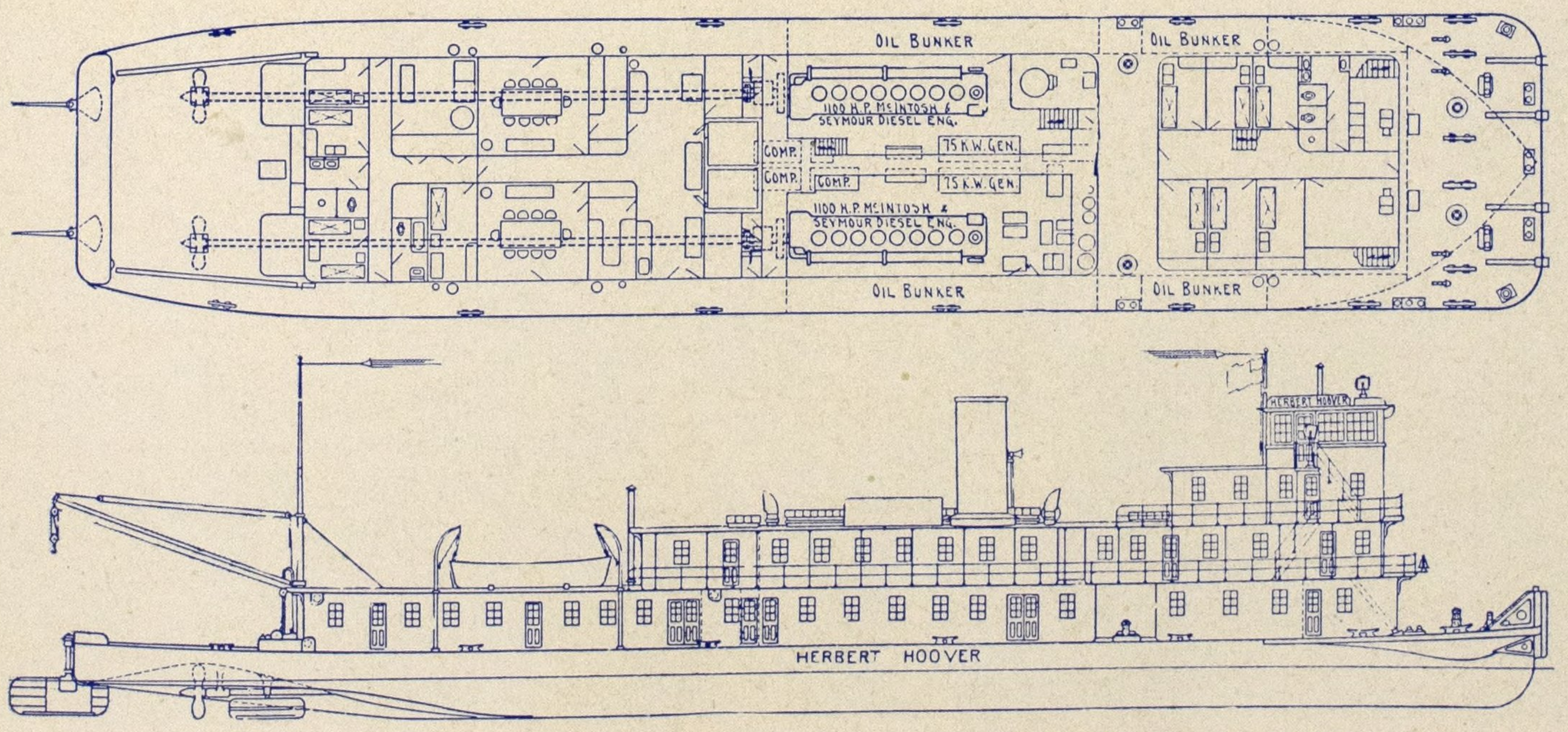
Name—Herbert Hoover
Owner—Inland Waterways Corp.
Builder—Dubuque Boat & Boiler Co.
Type—Twin screw tunnel river towboat
Completed—Under construction (April 1931)
Main Drive—Diesel direct at 200 r.p.m.
Length M'l'd.—215 feet; **Beam**—43 ft. 6 in.
Depth—10 feet; **Draft**—6 feet
Propellers—Two, 8 ft. dia. x 6 ft. 5 in. pitch
Fuel Capacity—150 tons of oil
Fuel Consumption—Lb. per b.h.p. per hr.—0.41
Capacity—Towing upstream, 10,000 to 12,000 tons in river barges

Remarks

This vessel was designed for the Inland Waterways Corp. by The Dravo Contracting Co. Each propeller works in a partial tunnel and is direct connected to one of the engines described here by means of a shaft of 8 inches in diameter increasing to 8 5/8 inches in diameter at the outboard bearing.

Maneuvering will be done by direct control of the engine in speed and direction of rotation. In addition to the main engines there are two 75-kilowatt generating sets driven by Atlas Imperial diesel engines.

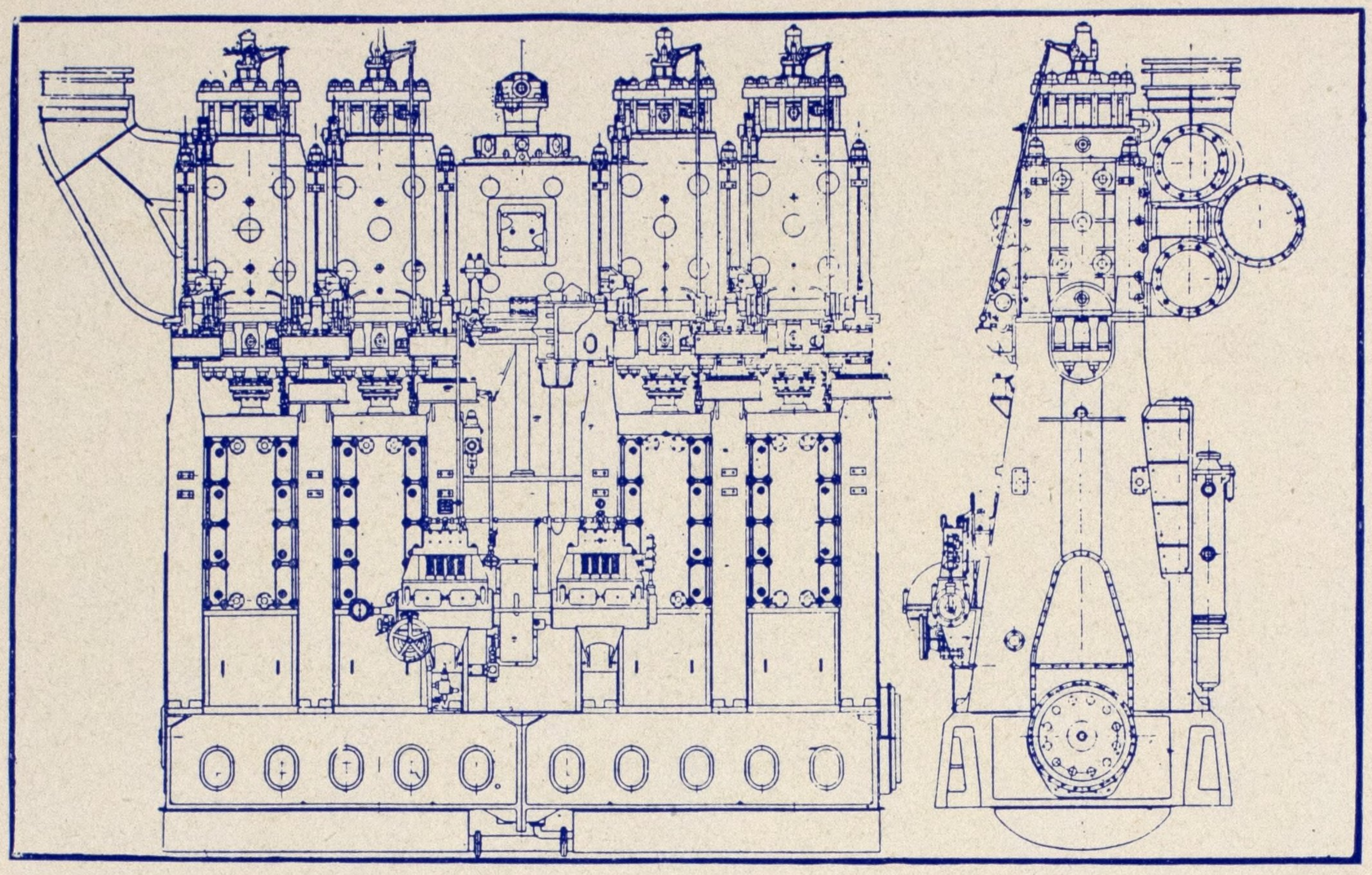
This is one of the most powerful towboats yet undertaken for river work. The hull is of steel and the bottom plating is 5/16-inch in thickness with a keel plate 3/8 of an inch thick which thickness is also used in 2/5 of the length for bilge plating. Frames are spaced 25 inches centers.



Twin Screw Tunnel Stern River Towboat Herbert Hoover—Two 1100 B. H. P. McIntosh-Seymour Diesels

Diesel Direct Drive in Freighter New Orleans

One Double Acting Engine—4000 B.H.P.



DESCRIPTION

One double acting two-cycle, air injection four-cylinder diesel engine as described on this page is fitted in this vessel. A sister vessel the WICHITA was similarly engined. Converted from steam to diesel. Trial trip of the NEW ORLEANS held June 26, 1929. Average speed on trial 14.3 knots. There is one fuel nozzle at the top and two at the bottom of each cylinder. Cylinders are jacketed and cooled with salt water.

Engine

Name of Engine—Hamilton M.A.N.; **Year**—1929
Builder—The Hooven, Owens, Rentschler Co.
Cycle—Two; **No. of Cylinders**—4; **I.H.P.**—5000
B.H.P.—4000; **Action**—Double acting
Injection—Air; **Scavenging**—Port scavenging
Piston Cooling—Fresh water; **Bore**—27½ inches
Stroke—47¼ inches; **Piston Speed**—867 f.p. min.
R.P.M.—110; **Pressure Indicated**—85 pounds
Pressure Brake—69 lbs.; **B.H.P. per Cyl.**—1000
I.H.P. per Cyl.—1250; **Mech. Efficiency**—81%
Stroke to Bore—1.718; **Wkg. Strs. Per Rev.**—8
Length O. A.—32 ft. 0 in.; **Height O. A.**—26 ft.
Width O. A.—16 ft. 0 in.; **Weight**—720,000 lbs.
Lbs. per B.H.P.—180; **Per I.H.P.**—144 lbs.
Reversing—By air, with sliding cams
Air Compressor—Three stage, vertical, attached

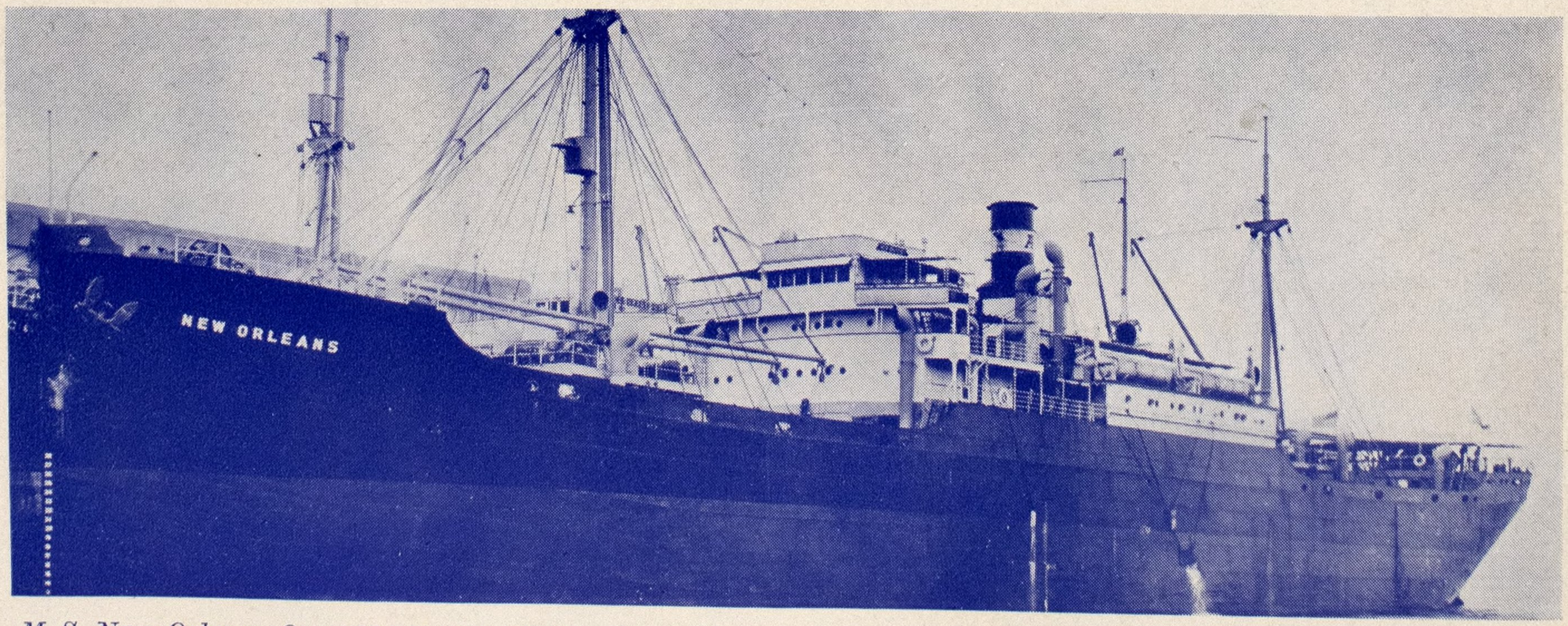
Vessel

Name—New Orleans; **Type**—Ocean freighter
Owner—United States Shipping Board
Operator—Roosevelt Steamship Co., Inc.
Builder—Converted by Federal S. B. & D. D. Co.
Length O. A.—411′ 9″; **Length B. P.**—395½′
Depth—34 ft. 11 in.; **Draft**—27 ft. ¼ in.
Displacement—13,141 tons; **Dwt.**—abt. 9400 tons
Speed—13½ knots; **No. of Propellers**—One
Fuel Capacity—1116 tons; **Fuel per Day**—18 tons
Fuel—Pounds per B.H.P. per hour—0.44
Radius Without Refueling—14,000 nautical miles
Generators—Two by Ellicott Co. of 340 kilowatts each direct connected to 500 b.h.p. Nordberg diesel engines

Remarks

The NEW ORLEANS and sister ship WICHITA have now been in operation for well over fifteen months in the Far East trade out of New York of the Roosevelt Steamship Co., Inc.

Complete service records of the NEW ORLEANS and the WICHITA are kept at the office of the United States shipping board, Capt. J. E. Bailey, in charge, 45 Broadway, and by the Roosevelt Steamship Co., Inc., 11 Broadway, New York city, Paul R. Smith, operating manager.



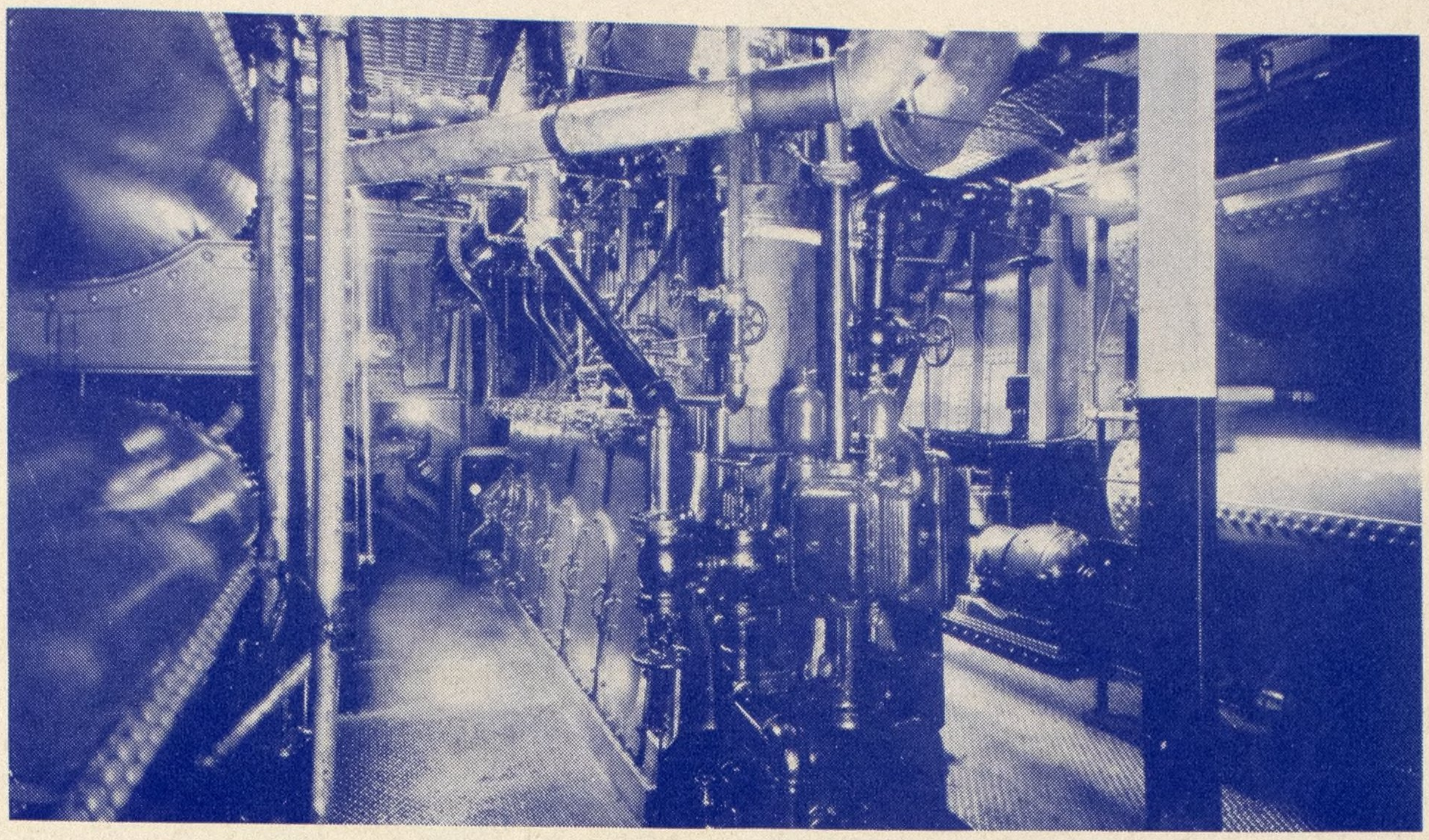
M. S. New Orleans One 4000 B.H.P. Double Acting Hooven, Owens, Rentschler Engine—Delivered June 26, 1929

Diesel Direct Drive in Tug K. Whittelsey

One Engine—800 B.H.P.

DESCRIPTION

One engine direct connected to the propeller is the main drive in this tug. It is a six-cylinder, four-cycle, airless injection, marine type of oil engine and is rated at 800 horsepower when operating at 240 revolutions per minute. Pistons are of the trunk type and the cylinders are fitted with individual cylinder liners. Lubricating oil system is of the pressure type to all bearings of the engine at about 25 pounds pressure.



Engine

Name of Engine—Ingersoll-Rand; **Year**—1930
Builder—Ingersoll-Rand Co.; **Type**—PR
Cycle—4; **No. of Cylinders**—6; **B.H.P.**—800
Action—Single acting; **Injection**—Solid direct
Bore—17¼ in.; **Stroke**—26 in.; **R.P.M.**—240
Piston Speed—1040 feet per minute
B.H.P. per Cyl.—133 1/3; **Mech. Efficiency**—85%
Stroke to Bore—1.5; **Wkg. Stkes. per Rev.**—3
Lgth. O. A.—23 ft. 7¾ in.; **Hgth. O. A.**—13 ft.
Width O. A.—6 ft. 8in.; **Wght. Eng.**—125,000 lbs.
Reversing—Yes; by moving single lever
Air Compresors—For starting air only

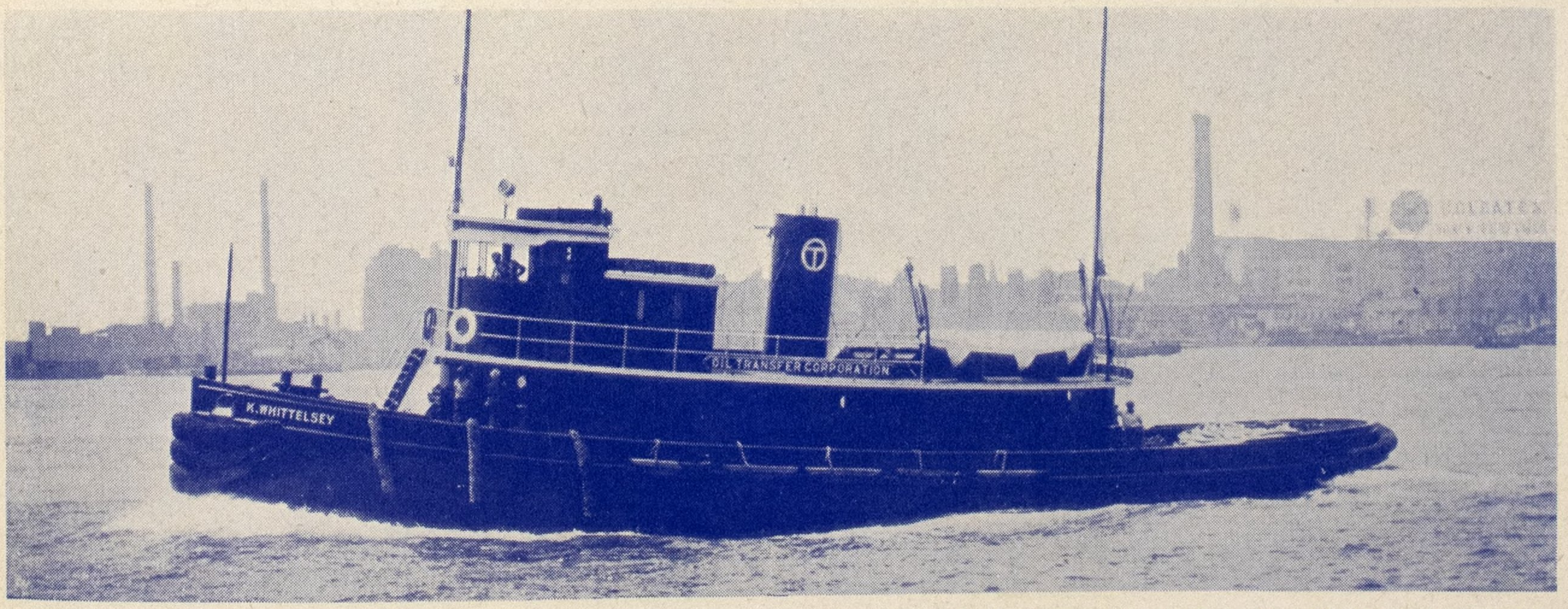
Vessel

Name—K. Whittelsey; **Type**—Ocean tug
Owner—Oil Transfer Corp.
Builder—Spedden S. B. Co.; **Completed**—6/26/30
Main Drive—Single screw direct connected diesel
Length B. P.—95 feet; **Beam**—22 feet
Depth—14 feet; **Draft**—10 ft. 6 in.
Speed—12 knots; **No. of Propellers**—One
Fuel Capacity—9000 gallons
Fuel Consumption—Lbs. per b.h.p. per hr.—0.41
Radius Without Refueling—2400 miles

Remarks

The K. WHITTELSEY is a fine, able, steel hull, harbor and ocean going tug. It is said that this engine is the largest direct reversible oil engine in towboat service on the Atlantic coast. The Oil Transfer Corp. is using the K. WHITTELSEY for towing barges making coastwise and Hudson river ports. The records of this tug since entering service have indicated the dependability and economy of the propulsive power.

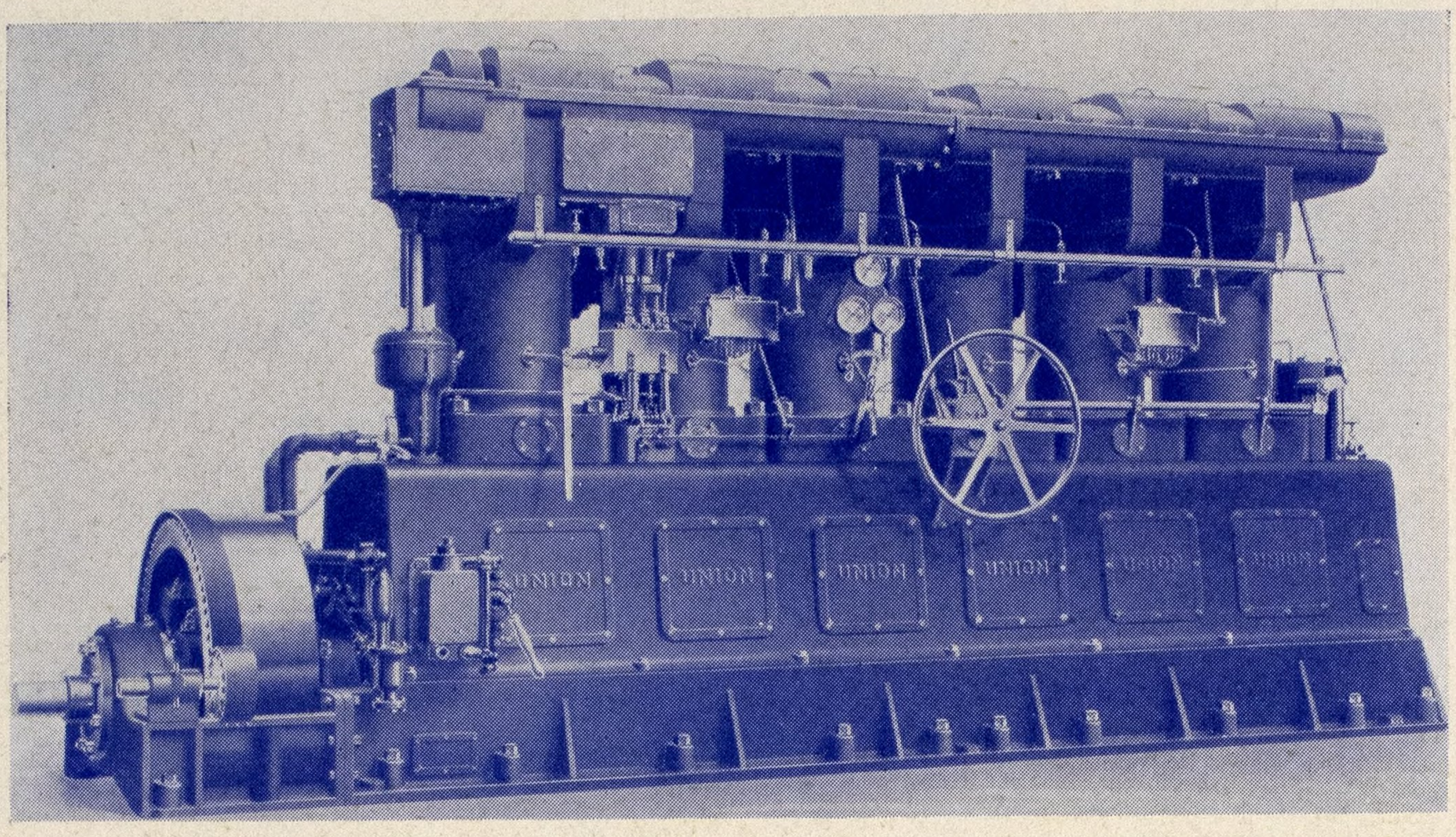
The reversing mechanism employed is simple. The valve events are symmetrically timed with reference to top and bottom dead centers. Thus the engine will run in either direction depending on the direction in which it is started. The direction of rotation is decided merely by admitting air to the proper cylinders. The control is by a single lever which also controls the fuel oil supply and hence the speed of the engine in either direction.



Tug K. Whittelsey with One 800 H.P. 6-Cylinder Ingersoll Rand Oil Engine—Steel Hull by Spedden S. B. Co.

Diesel Direct Drive in Freighter Island King

One Engine—400 B.H.P.



DESCRIPTION

This engine is of the heavy duty enclosed type with overhead camshaft. Forced feed lubrication is given to all bearings. The fuel system provides for simultaneus control of the injection valve period of opening and fuel pump suction valve period of seating. The cylinders are individual castings secured to the crank enclosure by four through stay bolts for each cylinder.

Engine

Name of Engine—Union Diesel; **Year**—1930
Builder—Union Diesel Engine Co.
Cycle—4; **No. of Cylinders**—6; **B.H.P.**—400
Action—Single; **Injection**—Solid (Mechanical)
Piston Cooling—None, cylinders of trunk type
Bore—13½″; **Stroke**—20½″; **R.P.M.**—225
Piston Speed—770 feet per minute
B.H.P. per Cyl.—66.6; **Stroke to Bore**—1.52
Working Strokes per Rev.—3; **Press. Brake**—80
Length O. A.—22 ft. 1⅝ in.; **Width O. A.**—5 ft.
Height O. A.—10 ft. 7½ in.; **Wght.**— 73,200 lbs.
Weight—Lbs. per b.h.p.—183
Reversing—Direct, by sliding camshaft
Air Compressor—For starting air only

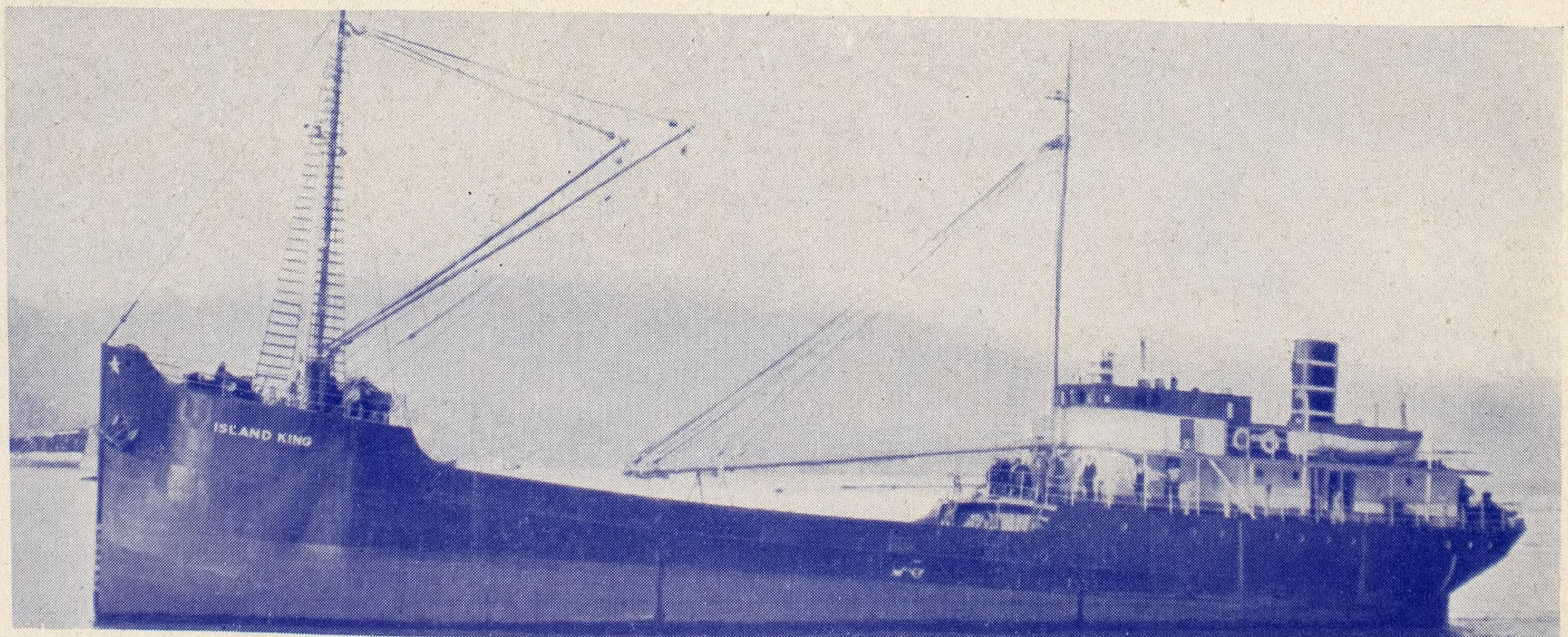
Vessel

Name—Island King; **Type**—Cement carrier
Owner—B. Columbia Cement Co., Victoria, B. C.
Builder—Built in Norway (converted to diesel)
Completed—Feb. 1930; **Drive**—Direct diesel
Length B. P.—165′; **Beam**—28′; **Draft**—14′6″
No. of Propellers—Single screw
Fuel Consumption—Lbs. per b.h.p. per hr.—0.42

Remarks

The Island King can operate throughout a 24-hour day on something less than two tons of fuel for all purposes. Diesel engine drive is especially suitable for off shore vessels of this and similar types. It can be started up practically immediately and there are no standby losses; also some space is undoubtedly saved by doing away with the fire room. It makes a good operating installation and also an economical one.

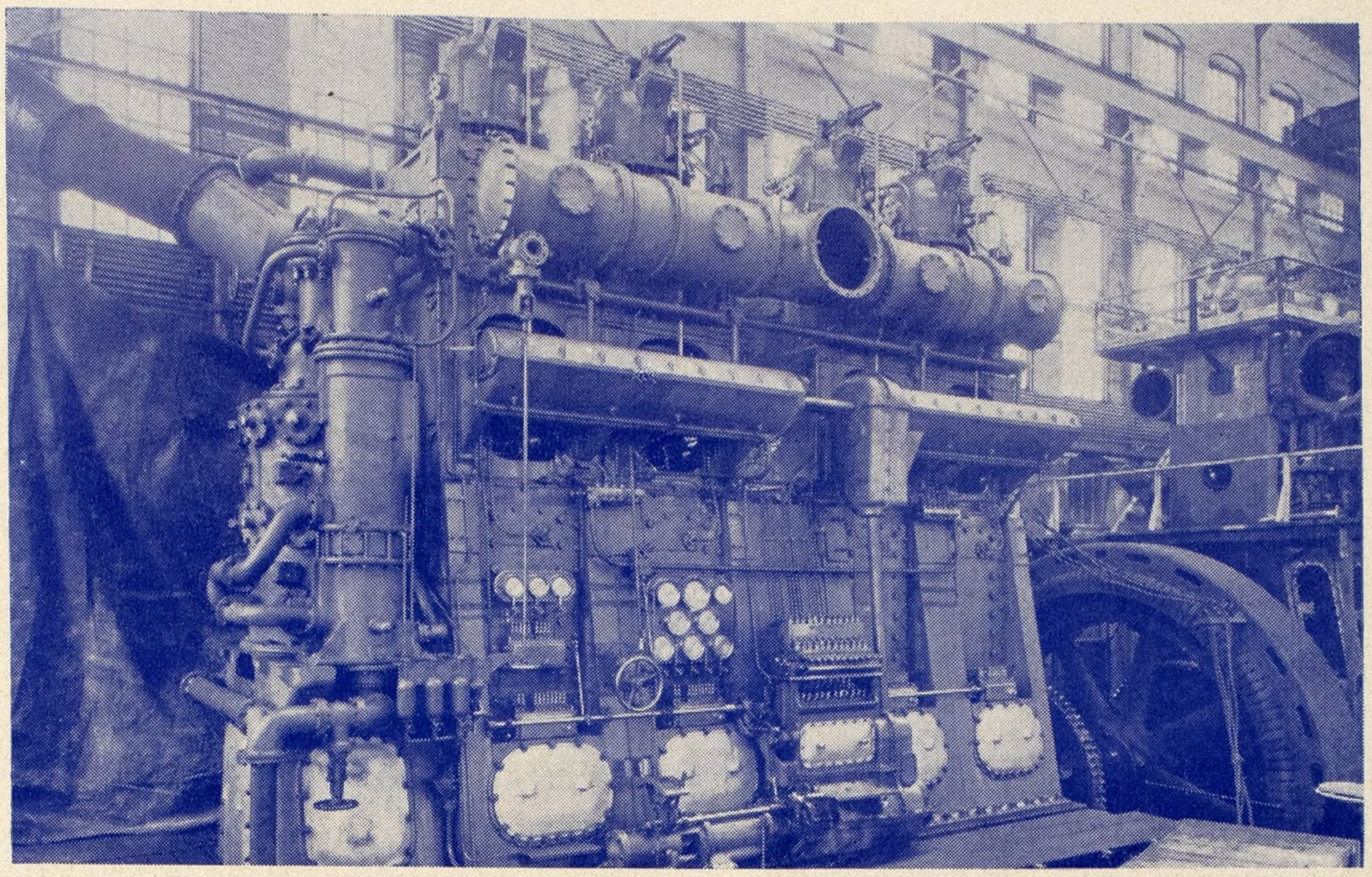
Four cycle engines, from 75 brake horsepower at 340 revolutions per minute with three cylinders, weighing 12,340 pounds, up to 700 brake horsepower at 235 revolutions per minute with eight cylinders, weighing 108,500 pounds are built by the Union Diesel Engine Co. They are single acting engines with solid injection and are of trunk piston type.



Single Screw Diesel Cement Carrier Island King—Fitted with One 400 B. H. P. Union Diesel Engine

Diesel Direct Drive in Freighter Jeff Davis

One Double Acting Engine—3625 B.H.P.



DESCRIPTION

One engine of this size and type direct connected to the propeller is fitted in the shipping board vessel Jeff Davis illustrated below and in a similar ship the Potter. It is a double acting, two cycle, air injection, four-cylinder engine. At normal operating speed 110 revolutions per minute 3625 horsepower is developed. During the trial trip 4130 brake horsepower was developed at 115 r.p.m.

Engine

Name of Engine—Worthington; **Year**—1929
Builder—Worthington Pump & Machinery Corp.
Cycle—Two; **No. of Cyls.**—4; **B.H.P.**—3625
I.H.P.—4600; **Action**—Double Acting
Injection—Air; **Scaveng.**—Port—separate blower
Piston Cooling—Fresh water; **Bore**—28 inches
Stroke—40 inches; **R.P.M.**—110 (normal)
Piston Speed—766.6 f.p.m.; **Pressure Ind.**—85
Pressure Brake—67; **B.H.P. per Cyl.**—906¼
I.H.P. per Cyl.—1150; **Mechanical Eff.**—78.8%
Stroke to Bore—1.428; **Wkg. Strokes to Rev.**—8
Lgth O.A.—32 ft. 5 in.; **Hght. O.A.**—31 ft. 1½ in.
Width O.A.—13 ft. 0 in.; **Weight**—735,676 lbs.
Weight All Machinery—1,142,676 pounds
Weight per B.H.P. Engine Only—203 pounds

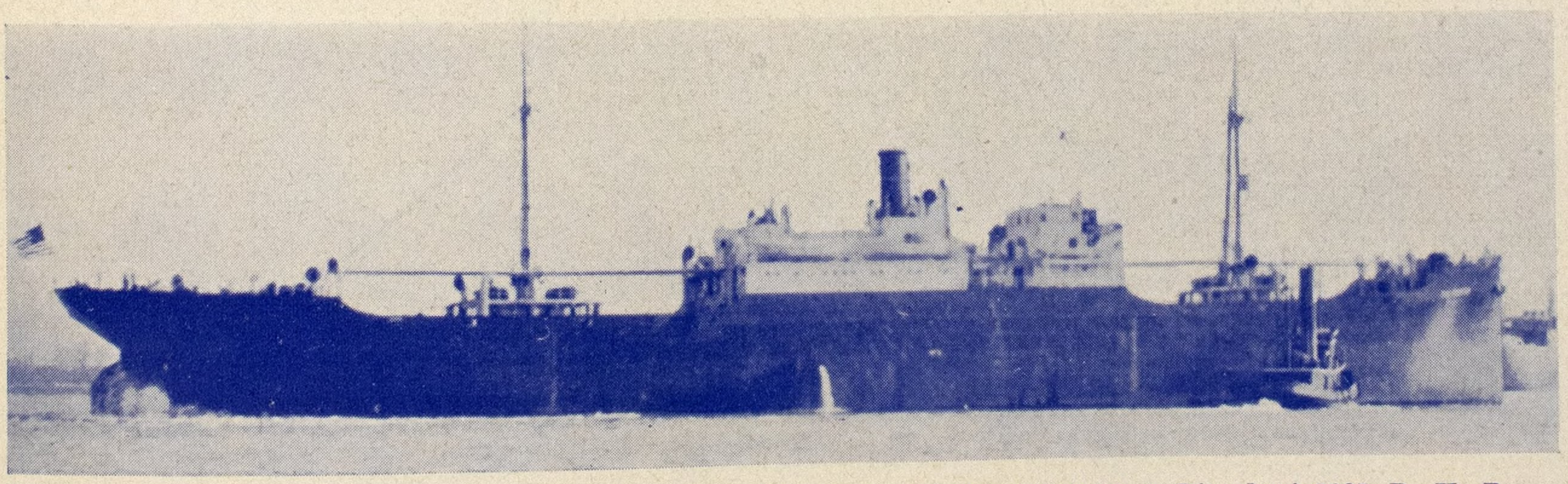
Vessel

Name—Jeff Davis; **Owner**—U. S. Shipping Board
Operator—Roosevelt Steamship Co. Inc.
Builder—Converted by Maryland Dry Dock Co.
Type—Combined passenger and cargo vessel
Completed—Oct. 17, '30; **Main Drive**—Diesel direct
Lgth. O.A.—411 ft. 9 in.; **B.P.**—395 ft. 6 in.
Beam—55 ft.; **Depth**—34 ft. 11 in.; **Draft**—27′ ¼″
Displ.—13,141 tons; **Deadweight**—9400 tons
Speed—13 knots; **Number of Propellers**—One
Fuel Capacity—In bunkers 1016 tons
Fuel Consump.—Lbs. per b.h.p. per hour—0.43
Fuel—Tons per day—for all purposes—15

Remarks

The Jeff Davis had her official trial trip on Oct. 17 a year ago. On her trials the best speed was 15.74 knots. Like her sister ship the Potter, she was converted at the Maryland Dry Dock Co. at Baltimore, at a cost of $1,036,345. This figure included installation and special alterations, main engine, deck machinery, engine room auxiliaries, and all incidentals. Since entering service a year ago the Jeff Davis with other shipping board diesel vessels has been operating between New York and Indian ports.

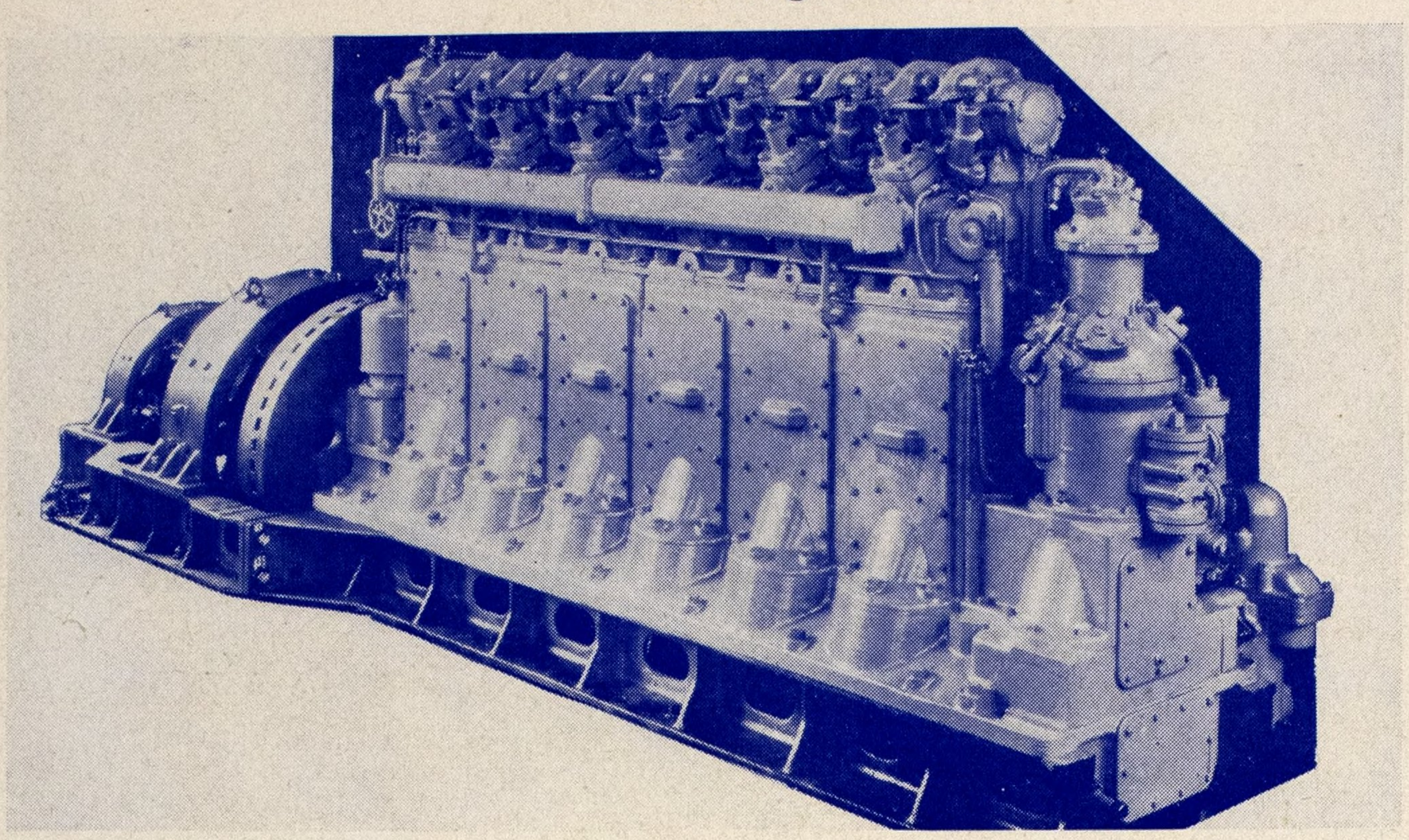
As this is written detailed information on the operation of this vessel, and the others of the program converted by the shipping board, is not available. Their actual service record during the past year can be ascertained, either from the office of the United States shipping board, Capt. J. E. Bailey, in charge, 45 Broadway, or from the Roosevelt Steamship Co. Inc., 11 Broadway, New York city, Paul R. Smith, operating manager.



M. S. Jeff Davis—Ocean Freighter—Fitted with Worthington Double Acting Diesel of 3625 B. H. P.

Diesel Electric Drive in Survey Boat Liston

Two Engines—Each 225 B.H.P.



DESCRIPTION

The survey boat Liston, designed by the corps of engineers for use at Philadelphia has a maximum of maneuverability due to its electric main drive. Two vertical six-cylinder, four-cycle air injection diesel engines as described on this page are each connected to an electric generator. The current so made is used in driving one propulsion motor directly connected to the propeller.

Engine

Name of Engine—Lombard; **Year**—1930
Builder—The Lombard Governor Co.
Cycle—4; **No. of Cylinders**—6; **I.H.P.**—283
B.H.P.—225; **Action**—Single; **Injection**—Air
Piston Cooling—Trunk piston; **Bore**—9½
Stroke—13½ in.; **R.P.M.**—400; 900 f.p.m.
Pressure Indicated—98½ lbs.; **Press. Brake**—78
B.H.P. per Cyl.—37½; **I.H.P. per Cyl.**—47½
Mech. Efficiency—79%; **Stroke to Bore**—1.42
Working Strokes per Revolution—Three
Lgth. O.A.—19′ 7½″; **Width O.A.**—5′ 7″
Height Overall—5 ft. 7 in. above C.L. of shaft
Weight—One engine, with generator and exciter attached, 36,100 pounds
Weight, Lbs. per B.H.P.—110; **Per I.H.P.**—87
Reversing—Non-reversing; **Air Comp.**—3-stage

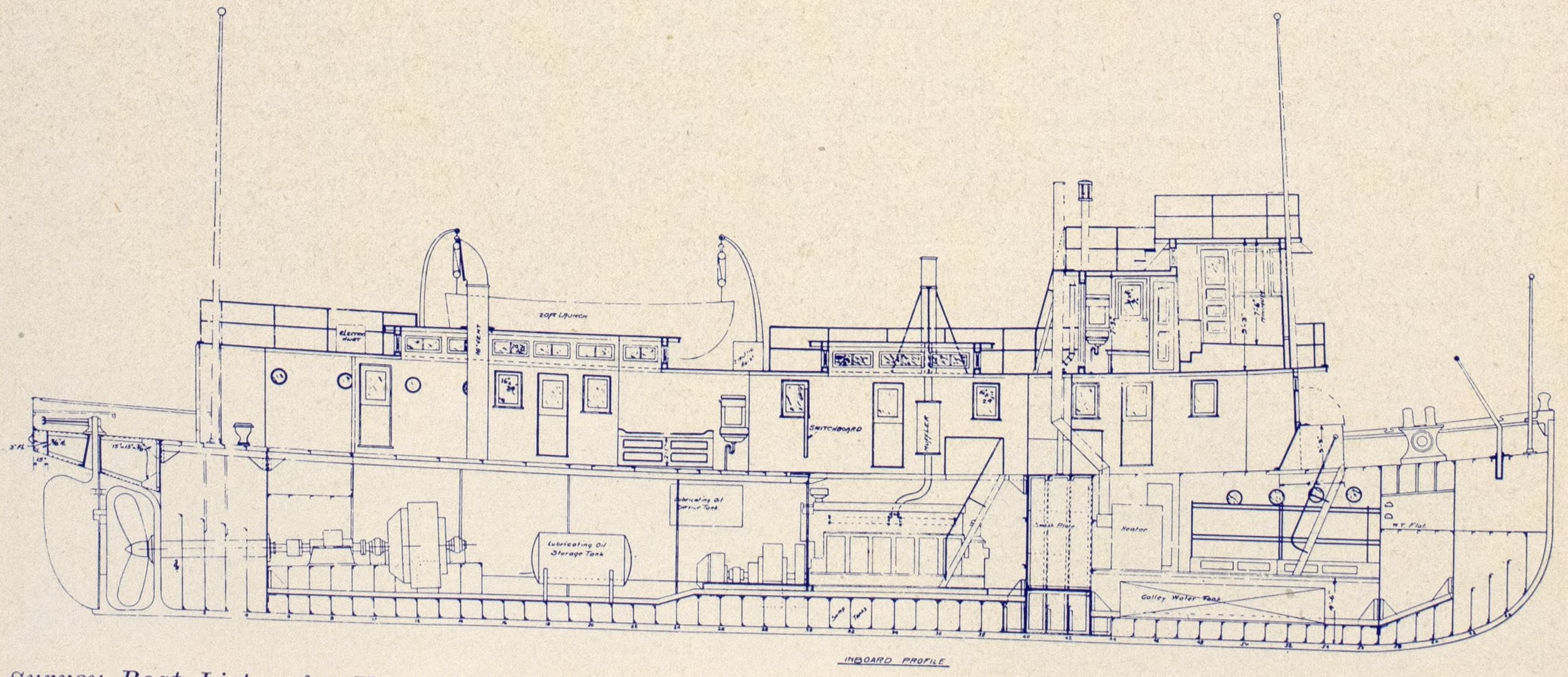
Vessel

Name—Liston; **Type**—Survey boat (tug type)
Builder—Charleston Dry Dock & Machine Co.
Completed—Oct. 1930; **Drive**—Diesel Electric
Owner—Engineering Department, U. S. Army
Length B.P.—100 feet 3 inches; **Beam**—22 ft.
Depth—10′ 6″; **Draft**—8′ 3″ for., 9′ 3″ aft.
Displacement—308 tons; **Speed**—9 knots
No. of Propellers—One, 4-blade, cast steel, solid wheel, 8′ 0″ diameter, 6′ 9″ pitch
Fuel Capacity—145 barrels or 22 long tons
Fuel Consumption—Lbs. per b.h.p. per hr.—0.42
Generators—Main drive, two, 145 k.w. 125 v. each at 400 r.p.m. direct current; each direct connected to one of the diesel engines described above.
Propulsion Motor—One, open, shunt wound, 350 b.h.p., 230 r.p.m. Motor and generators, General Electric

Remarks

The Liston is a 105-foot overall length, single screw, steel tug and is to be used by the United States engineers for survey work on the Delaware river. Accommodations are provided for 20 men, officers, crew and survey party.

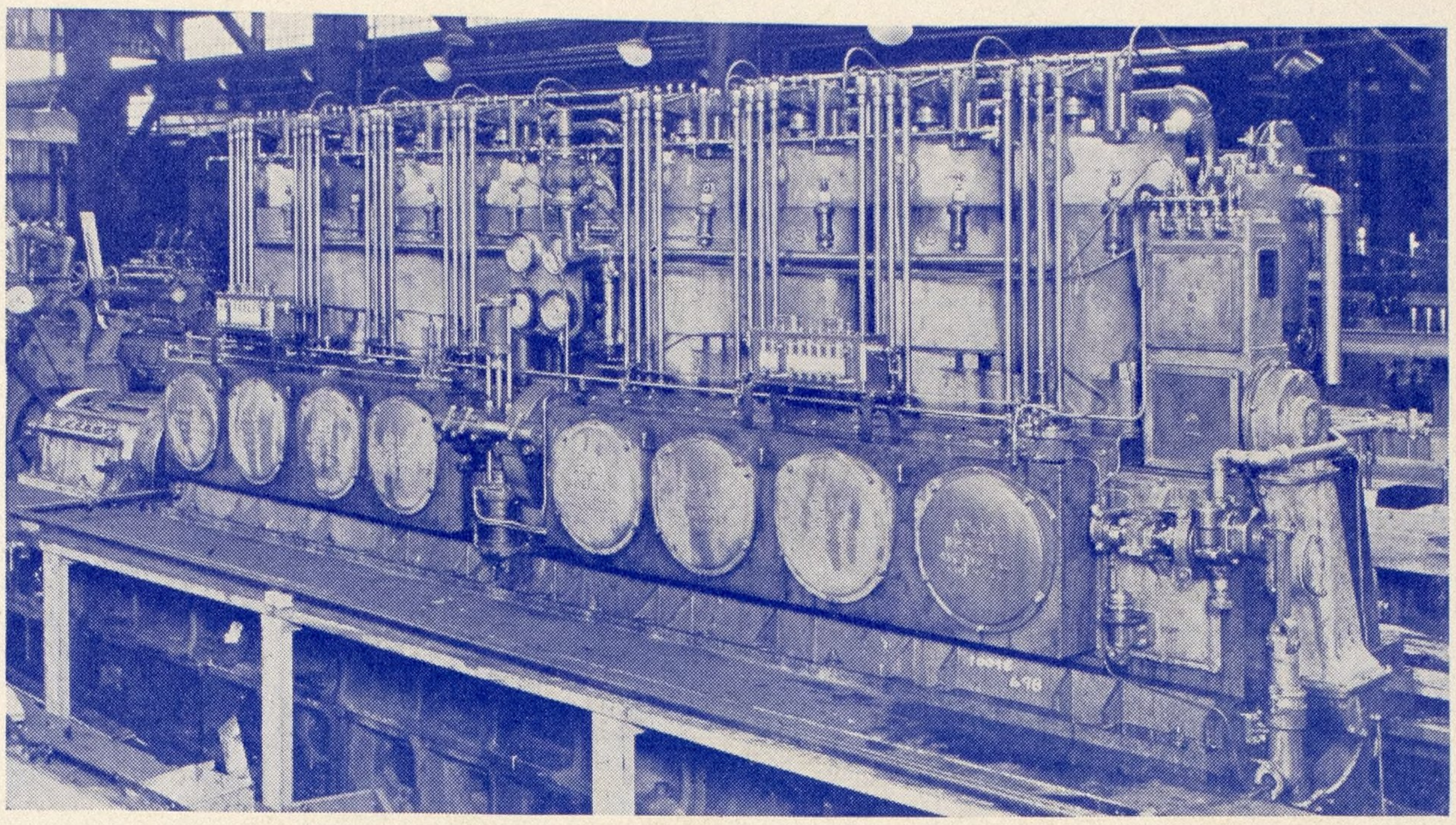
Each of the main generators of 145 kilowatts capacity has a 15 kilowatt exciter on an extension of the shaft. An auxiliary generator is carried of 10-kilowatt capacity which is direct driven by a 16 horsepower Cummins diesel engine.



Survey Boat Liston for U. S. Engineers—Diesel Electric—Lombard Engines—Two Generators, One Motor

Diesel Direct Drive in Freighter Kvichak

Two Engines—Each 500 B.H.P.



DESCRIPTION

This vessel is equipped with two eight-cylinder, four-cycle, solid injection diesel engines each of 500 brake horsepower. These engines are directly connected to propellers and at 275 revolutions per minute give the vessel a speed of ten knots. The KVICHAK is a steel hull, schooner rigged vessel originally built in 1900 and equipped with steam. The present conversion took place in 1930.

Engine

Name of Engine—Atlas-Imperial; **Year**—1930
Builder—Atlas-Imperial Diesel Engine Co.
Cycle—Four; **No. of Cylinders**—8; **B.H.P.**—500
I.H.P.—680; **Action**—Single; **Injection**—Solid
Piston Coolg.—Air; **Bore**—13 in.; **Stroke**—16 in.
R.P.M.—275; **Piston Speed**—733 feet per min.
Pressure Indicated—117; **Pressure Brake**—84
B.H.P. per Cyl.—62½; **I.H.P. per Cyl.**—85
Mechanical Eff.—76½%; **Stroke to Bore**—1.23
Length O. A.—28 feet; **Height O. A.**—8 ft. 7 in.
Width Overall—5 feet; **Weight**—75,900 pounds
Reversing—Directly reversible
Air Compressors—For maneuvering only

Vessel

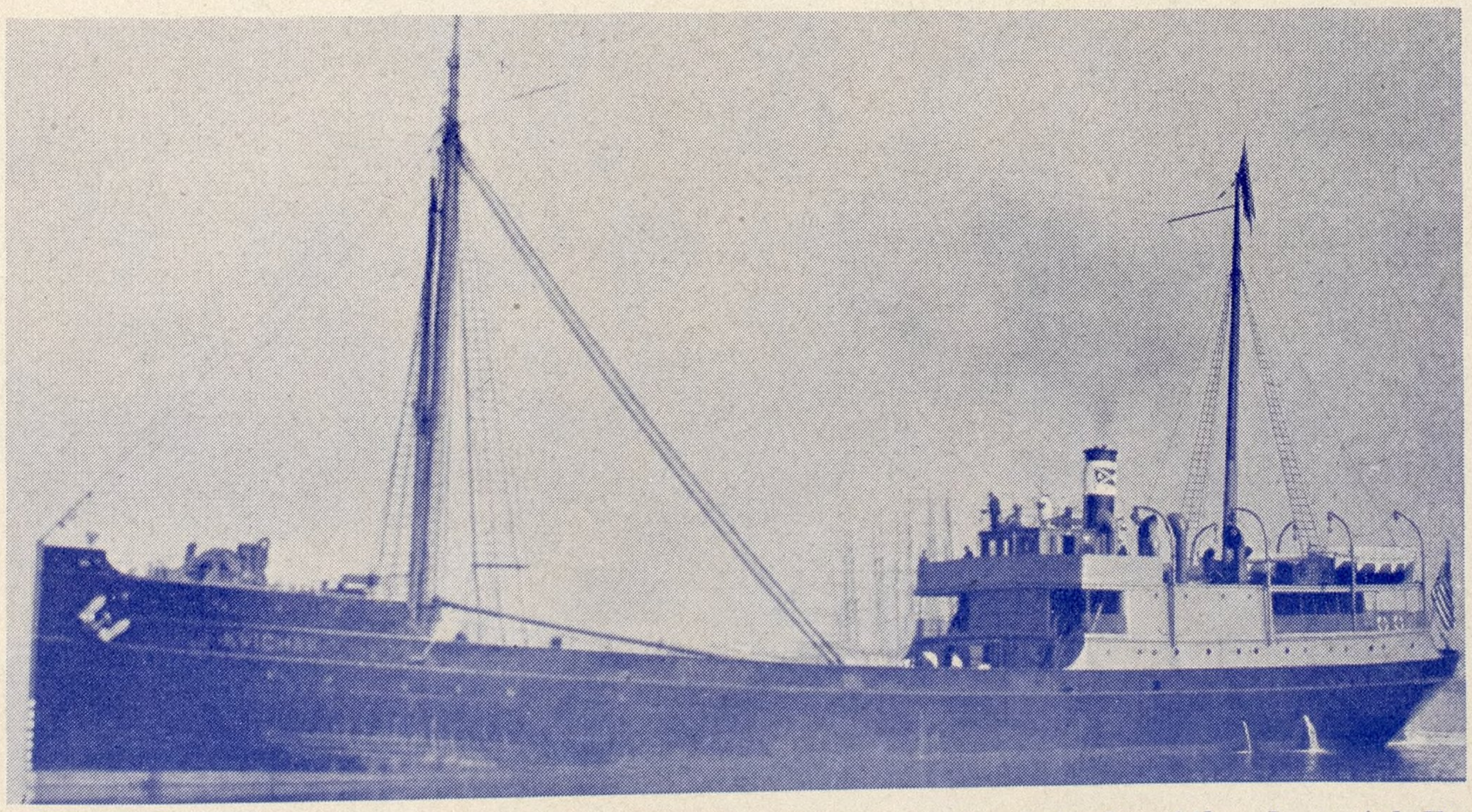
Name—Kvichak; **Type**—Freight, passenger, tow
Owner—Alaska Packers Association
Builder—Wolff & Zwicker, Portland, Ore.
Main Drive—Twin screw direct connected diesel
Length B. P.—200 feet; **Beam**—35 ft. 2½ in.
Draft—loaded, 16 ft.; **Displ.**—2250 tons
Deadweight—1200 tons; **Speed**—10 knots
No. of Propellers—Two; **Fuel Cap.**—3542 bbls.
Fuel Consumption—Lbs. per b.h.p. per hour—.42
Radius Without Refueling—27,000 nautical miles
Generators—Four—Two 5 k.w., one 10 k.w. and 7½ k.w. Total—27½ k.w. Westinghouse

Remarks

The windlass, cargo winches, steering gear, towing engine and all other auxiliaries are operated by air heated by the exhaust gases. The vessel is fully equipped as a fire boat having a 110-horsepower fire pump connected to six 1½-inch outlets and two monitors. On the KVICHAK's return voyage from Alaska this fall, she towed the sailing ship STAR OF ALASKA from Chignik bay to San Francisco, a distance of 1835 miles, in 9 days and 7 hours, making an average of 8.3 knots without any appreciable assistance from the sails of the ship.

The KVICHAK has two masts, a high straight bow and a round overhanging stern. The house extends from amidships to a point near the stern. She is used in the salmon fishing industry for carrying passengers (159 persons), freight and for towing.

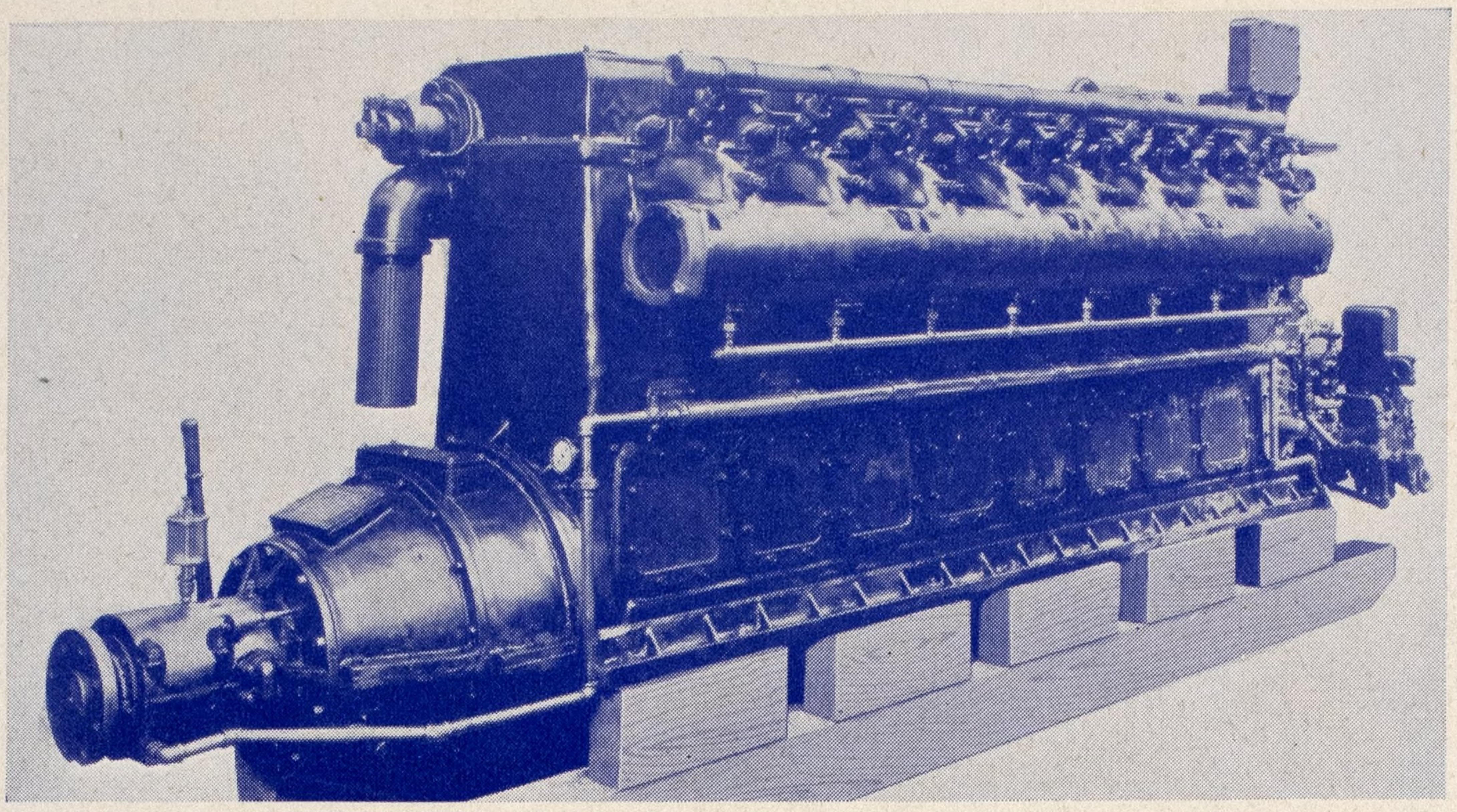
Engines are built in sizes ranging from 30 horsepower two cylinders to 500 horsepower eight cylinders.



Twin Screw Diesel Freighter Kvichak—Two 500 B. H. P. Eight Cylinder Atlas Imperial Engines

Diesel Direct Drive in Hoisting Vessel H-1

One Engine—225 B.H.P.



DESCRIPTION

One engine as described on this page is installed in the army hoisting vessel H-1; direct connected to propeller. This is a medium speed, heavy duty, marine engine with five-inch crankshaft. Cylinder liners are removable. There are dual valves and totally enclosed camshaft and rocker arm assembly. Forced feed lubrication is provided to every moving part.

Engine

Name of Engine—Fulton-Diesel; **Year**—1930
Builder—Fulton Iron Works Co.; **Cycle**—4
No. of Cyls.—6; **B.H.P.**—225; **Action**—Single
Injection—Solid; **Bore**—8½ in.; **Stroke**—11 in.
R.P.M.—680; **Piston Speed**—1250 feet per min.
Pressure Brake—70 lbs.; **B.H.P. Per Cyl.**—37.5
Stroke to Bore—1.3; **Wkg. Strokes per Rev.**—3
Length O.A.—13 ft. ⅛ in.; **Height O.A.**—5′ 10″
Width—2 ft. 6 in.; **Weight**—15,800 pounds
Reversing—Direct; **Air Compressor**—Integral

Vessel

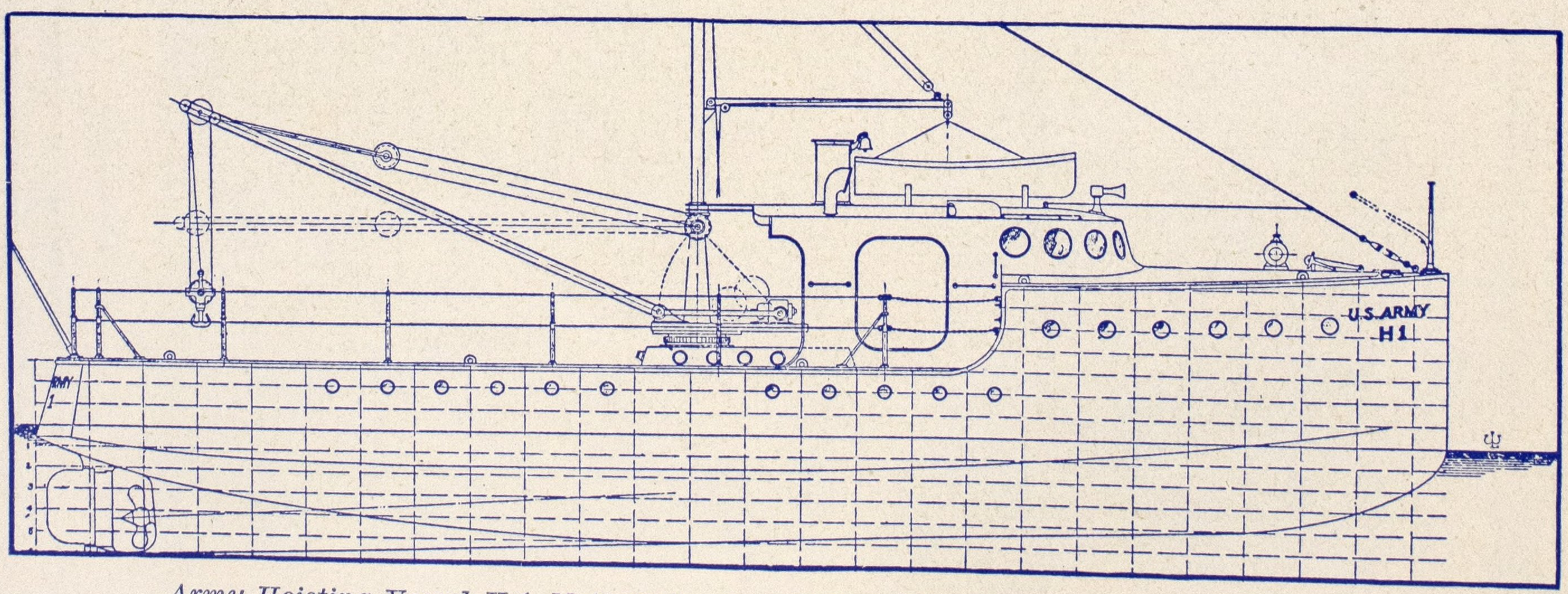
Name—H-1; **Type**—Hoisting vessel for Army
Owner—United States (War Department)
Builder—Hampton Roads Shipbuilding Co.
Type of Construction—Welded steel, longitudinal framing straight line sections.
Completed—Due for delivery Jan. 1, 1931
Main Drive—Diesel direct; single propeller
Length O.A.—64 ft.; **Beam**—18 ft.; **Depth**— 8 ft.
Draft Loaded—6 feet 0 inches
Fuel Consumption—Lbs. per b.h.p. per hr.—0.45
Fuel Capacity—1000 gallons

Remarks

This boat has been designed for work of the war department in lifting weights from the water or from piers, such as salvaging fallen airplanes or lifting cargo and on the mine field in making up the joints of various submarine electric cables or for hoisting on board or on piers the ordinary boxes and crates of quartermaster freight. The weight to be lifted on the 24-foot boom is not over 7 tons. The vessel is intended to work in the open sea as circumstances require.

The under water body is of the V-bottom type and was designed to facilitate the use of welding. Longitudinal system of framing was adopted for the same reason. Practically no wood is used in the construction of the vessel. The boat is suitable for occasional towing purposes.

Three electric motors of 110-volt direct current type are used for operating the cargo hoist. One is to serve the boom lift, one to raise the load and one to rotate the turntable with boom. The total generator capacity is 15 kilowatts.



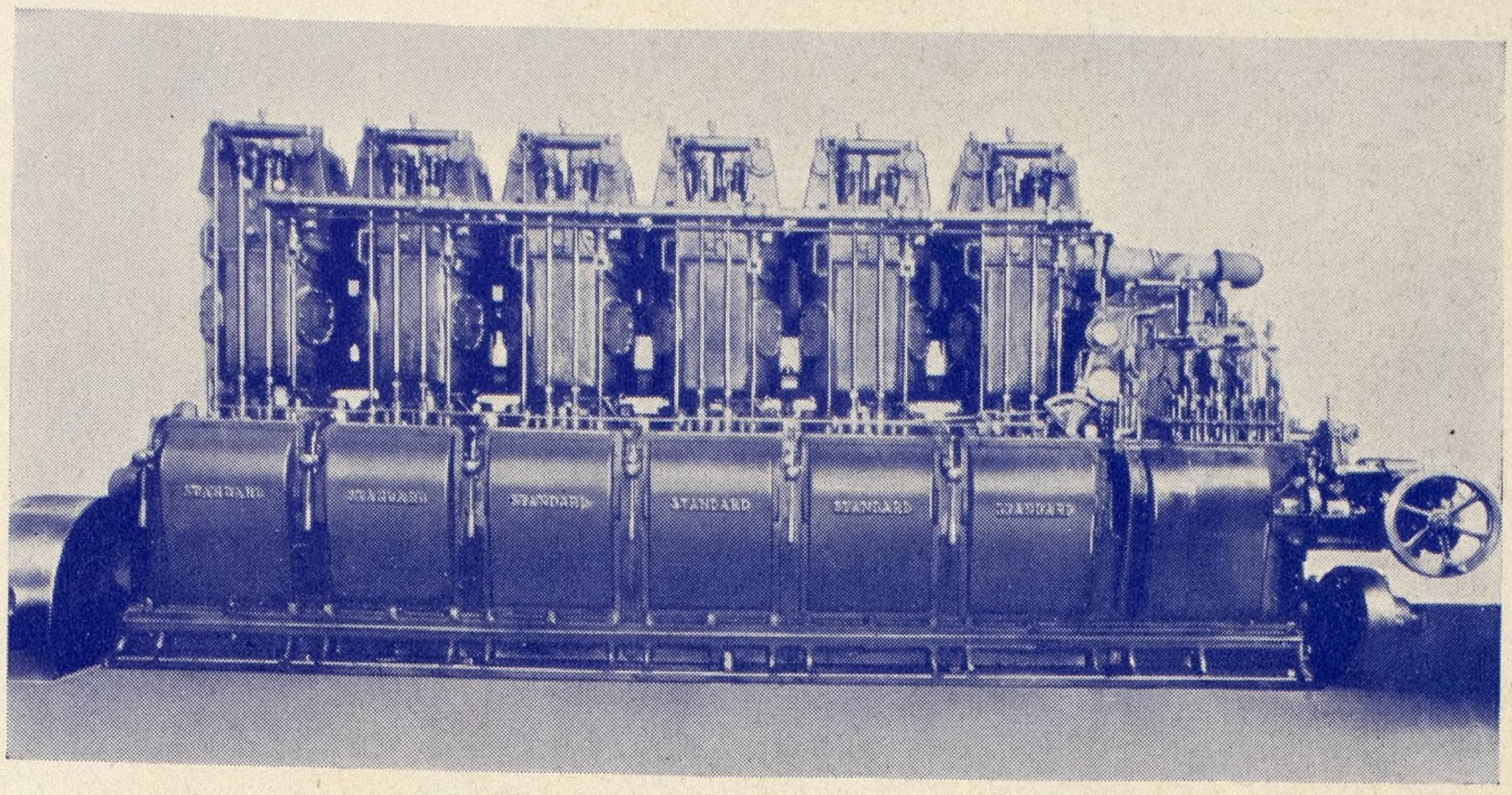
Army Hoisting Vessel H-1 Main Drive One Fulton Diesel 225 B.H.P. Direct Connected

Diesel Direct Drive in Harbor Boat G. B. Loring

One Engine—330 B.H.P.

DESCRIPTION

One engine of the size and type described on this page is direct connected to a single propeller in this quarantine boat for service in Boston waters. The engine is of single acting four-cycle, heavy duty solid injection, marine type. It is a simple, rugged and dependable diesel engine for heavy service in everyday operation.



Engine

Name of Engine—Standard diesel; **Year**—1930
Builder—Standard Motor Construction Co.
Cycle—4; **No. of Cylinders**—6; **B.H.P.**—330
Action—Single; **Injection**—Mechanical (solid)
Piston Coolg.—Air; **Bore**—12 in.; **Stroke**—17 in.
R.P.M.—300; **Piston Speed**—850 feet per minute
Pressure Indicated—88 lbs.; **Pres. Brake**—75.6
B.H.P. per Cyl.—55; **Mech. Efficiency**—85%
Stroke to Bore—1.42; **Wkg. Strokes per Rev.**—3
Length O. A.—17 feet 4 11/16 inches
Height O. A.—6 ft. 5½ in.; **Width O. A.**—47½ in.
Weight—38,000 lbs.; Lbs. per **B.H.P.**—115
Reversing—Direct by shifting camshaft
Air Compressor—Attached; starting air only

Vessel

Name—G. B. Loring; **Type**—Boarding boat
Owner—United States Public Health Service
Main Drive—Diesel direct connected
Length B.P.B.—90 feet; **Beam**—20 feet
Draft—10 feet in loaded condition
Speed—11.4 knots; **No. of Propellers**—One
Fuel Consumption—Lb. per b.h.p. per hr.—0.45

Remarks

In the boats used for quarantine duty of the United States public health service the diesel engine seems to be particularly suitable due to the many contacts with incoming vessels which are a part of the day's work.

Often a doctor must be put on board while a vessel is under way. Also, close maneuvering must be accomplished in crowded water. The necessary flexibility and responsiveness is found only in the direct reversing type of diesel, and it is this type that approximates the steam engine in these features. One great advantage in the diesel engine is its instant readiness night or day, with consequent elimination of standby losses by saving labor and fuel.

The diesel engine is especially suitable in a boat of this type because it is in every respect self-sufficient. The smaller the boat the better it is to have the main power plant self-contained and independent of any other machinery for functioning. The size of the plant also makes it possible to install a comparatively high speed light engine of a type which has been exhaustively tried out in actual service.

G. B. Loring Single Screw Standard Diesel Engine—United States Quarantine Service

The Leviathan, Majestic, and Berengaria in the Southampton Docks

British Shipping at Low Point

Little Change Shown in Quarterly Report—Slump Continues Unabated —Consider Compulsory Scrapping of Ships to Provide Employment

By Frank C. Bowen

ALTHOUGH one is constantly hearing the hope expressed that shipping has reached rock bottom, and that improvement is just around the corner, the slump continues unabated and now is the longest in the history of shipping, the conditions of the European industry during the last quarter being depressing in the extreme.

On the Western Ocean, the figures for the season show a very distinct decline in luxury, although as regards numbers this is compensated for by the increased number of people crossing the Atlantic in the cabin and tourist classes. Yet, at the present time there are many giant luxury liners either building or projected, and, frankly, it is difficult to see where their passengers will come from. Unless there is a very great revival by the time the new ships are put in service, one can foresee cut-throat competition in the transatlantic service, possibly even resulting in the collapse of the conference. If it did come to that, the confusion that would naturally arise may be imagined.

The scheme of shipbuilding rationalization in Britain which was to be floated by the National Shipyard security, a concern owned by the various shipbuilders for the purpose of buying the less successful yards and closing them down in the interests of the others, has started operations by buying William Beardmore's of Dalmuir on the Clyde. It is an historic yard, the successor of Robert Napier's who had such a lot to do with the establishment of Clyde shipbuilding on a big scale a century ago, and has a great reputation, but recently it has been very slack. It has had no commissions for liners and few for warships, so that the closing of the yard, while it clears the air, makes little difference to the labor situation. This sale does not affect in any way the repair or engineering branches of the firm.

In the latter, Beardmore's are very busy, for they have been one of the principal British advocates of the Bauer-Wach combined reciprocating engine and turbine, which is very rapidly increasing in popularity in Europe. At the present time there are a very large number of sets being fitted into cargo and passenger liners with invariable success, while fleets are being converted as they can be taken out of service.

The electric variation of the Bauer-Wach system, whereby the exhaust turbine runs a generator which supplies current to a motor on the shaft instead of transmitting its power directly to the shaft by means of hydraulic gearing, also is making some headway, although the only two firms who have shown it favor are the Penninsular and Oriental line and the Ellerman group. The latter have been successful all the way through, and the 20,000-ton P. and O. MOOLTAN, after having some early troubles, now seems to have settled down to be an unqualified success.

With regard to the pure electric drive, the field again is restricted, but the P. and O. line has two particularly interesting ships building for the Australian mail service. Hitherto their details have been kept secret, but it now is announced that they will have a gross tonnage of 20,000 apiece, while their shaft horsepower will be 28,000, against the 17,000 of the very successful pioneer VICEROY OF INDIA. This will give them a speed of 21 knots, with ample reserve for emergency, so that there is every hope that it may prove possible to come to an arrangement with the post office authorities to improve the Australian mail schedule, an improvement for which Australians have been pleading for many years.

But apart from these big ships and a few others—serious work will start on the new giant Cunarder in November—there is very little that is encouraging that can be said of the British shipbuilding situation. There is, in fact, the worst winter

Trend of Trade and Shipping in British Isles

	June	July	August	Eight months ended Aug. 31 1930	Eight months ended Aug. 31 1929
Total entrances of cargo ships into British ports:					
Number of vessels	5,782	5,573	5,100	39,146	38,340
Tonnage	5,812,190	6,046,431	5,638,809	42,187,847	40,904,152
Tonnage from Atlantic coast of North America	1,343,339	1,384,119	1,363,131	8,569,981	8,732,225
	(23%)	(23.1%)	(24.2%)	(20.3%)	(21.4%)
Total clearances from British ports:					
Number of vessels	4,859	5,402	5,267	40,763	42,674
Tonnage	5,335,331	5,714,474	5,888,715	44,260,037	45,481,956
Tonnage going to Atlantic coast of North America	1,008,886	1,028,599	1,162,714	7,225,169	7,389,439
	(18.7%)	(17.6%)	(19.9%)	(16.3%)	(16.3%)
Total value of goods:					
Exported	£50,724,315	£57,409,885	£49,119,138	£460,659,825	£566,008,781
Imported	£83,441,738	£85,230,874	£79,905,363	£706,663,040	£798,819,688
Exports of coal:					
Tons	4,057,312	4,653,579	3,933,677	37,135,926	38,918,150
Value	£3,333,653	£3,898,123	£3,198,638	£31,085,636	£31,035,641
Tonnage shipped for use of steamers	1,221,056	1,358,200	1,335,159	10,391,396	10,935,048

for many years in prospect, with practically no orders being placed by the owners to compensate for the large number of tankers, mostly Norwegian, which now are completing and being delivered, but which seem definitely to end the prospects in that direction.

In such circumstances it is not surprising that quite a number of tankers now are being laid up at the various berths round the coast, particularly in Britain, but it is becoming a hard task to find space for them, as most of the advantageous places already are occupied by cargo ships or liners. The figures for July 1 for Britain alone showed an increase of 4 per cent as compared with the previous quarter and 143.4 per cent as compared with July, 1929. To draw a useful comparison between the British bid-up figures and those of the other European countries is most difficult, for even the figures placed before the house of commons were admittedly taken on two entirely separate bases for British and continental ships. Another reason why the laying up figures cannot be taken as really indicative of the shipping situation is the growing proportion of the world's cargo movement that is being carried in cargo liners. These naturally run half full or less in which case the tramps would be laid up. Consequently, to estimate the true position, it is necessary to get at the exact proportion of cargo liners and tramps under each flag, an impossible task or at least hardly worthwhile.

As has long been expected, the labor government in Britain has launched a scheme for the compulsory scrapping of obsolete ships. A committee has been appointed to consider the matter and see whether it can be made practical, the shipping industry being represented by Sir Frederick Lewis, the head of the Furness Withy group, and Sir Ernest Glover, who is one of the most successful and best known tramp shipowners under the British flag. The hope is, of course, to provide employment, not only in the shipbuilding, but also in the ship-braking industry, which employs so much unskilled labor; but although they are willing to give every possible help in the hope of coming to a solution of the difficulty, practical shipping men are not really optimistic as to the chances of success of the scheme. To begin with, it talks of making 20 years of age a datum line, and this is such an easy slogan, and so obviously impractical to the shipowner, that he already dreads political interference in its work.

At the same time the business of disposing of old tonnage continues to be difficult, for the scrap steel market is not happy and the price now obtainable is very low. Several former P. and O. liners which would normally have gone to the scrappers have been sold to the Japanese to be converted into sea-going depot ships and canneries for the crab and other fisheries in the North Pacific, fisheries which recently have been interfered with by the Soviet officials on shore. One or two others have gone to the whaling companies, while there appears to be the beginning of a market among the minor powers, Jugo-Slavia having begun by buying the well-known Royal Mail Steam Packet liner ARAGUAYA.

Altogether, the prospects remain very depressed for the shipping and shipbuilding industries, and the end of the slump appears to be as far away as ever.

Holds First Meeting

At the organization meeting held in New York on Oct. 15 by charter members of the recently organized American Institute of Shipping, the constitution and by-laws were adopted and a program of activities discussed. In a general way the institute plans to confine its activities to research of a purely practical character and to the application of the best industrial methods to the problems of shipping. In the statement of purpose accompanying the application for a charter for the organization it was set forth that:

This organization exists for the interchange of ideas and the dissemination relative to ship operation. Attention is focused on cargo handling, safety engineering and the selection, training and compensation of employes and other subjects.

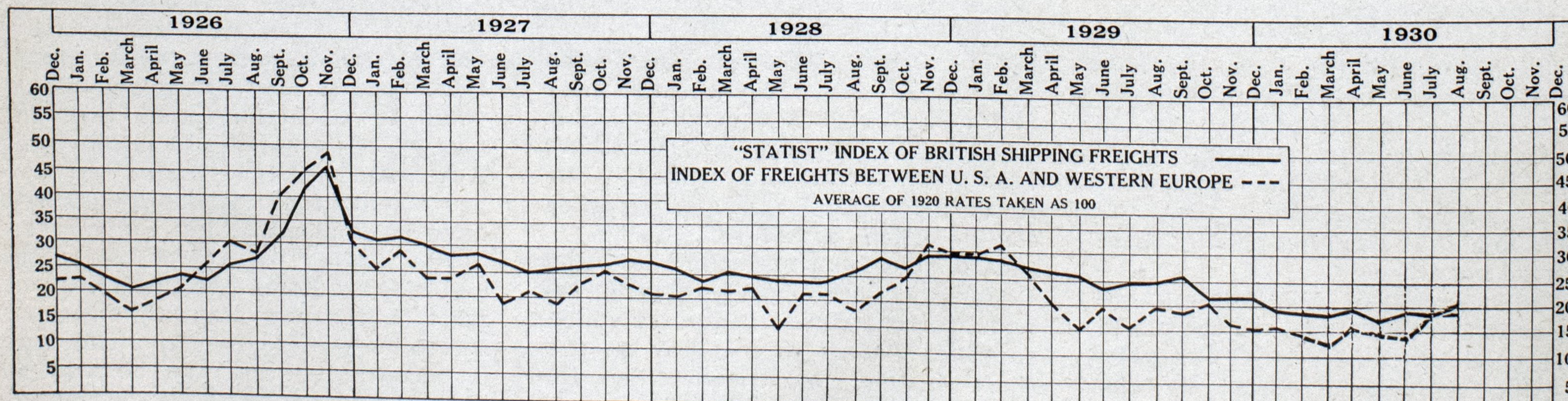
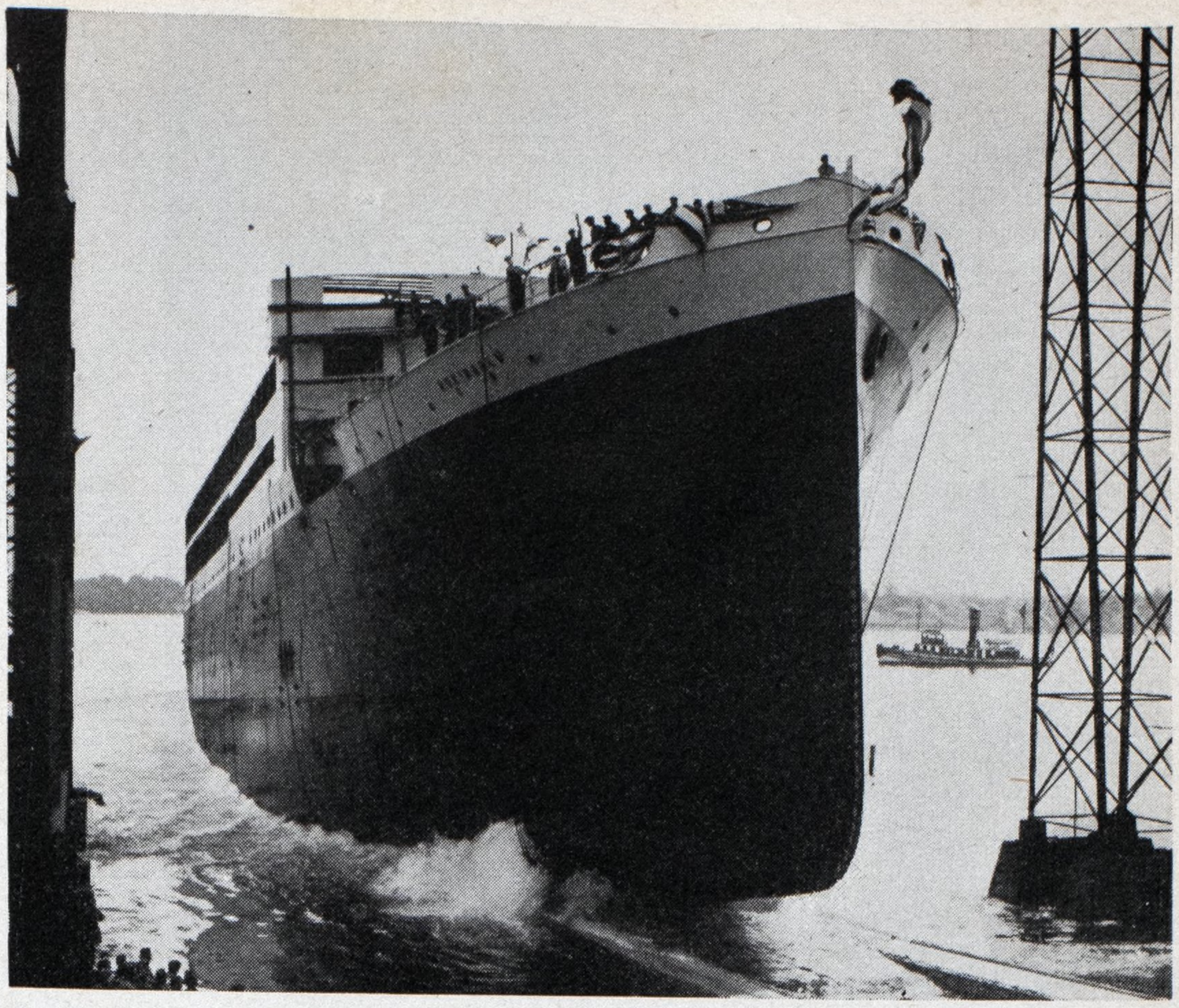


Diagram Showing Fluctuation of Freight Rates for Four Years and Five Months

Launching Data S. S. Borinquen

Arrangement of Ways—Speed Recorder — Hydraulic Triggers — System of Slowing Speed of Ship.



Launching of the S. S. Borinquen at Fore River Yard of Bethlehem Shipbuilding Corp., Quincy, Mass., Sept. 24

FROM the launching Sept. 24 of the S. S. BORINQUEN at the Fore River plant of the Bethlehem Shipbuilding Corp., Ltd., at Quincy, Mass., a considerable amount of interesting data was compiled by the technical staff of the builders.

The BORINQUEN is a combination freight and passenger steamer built for the Atlantic Gulf and West Indies Steamship Co. for their New York to Porto Rico service, and is quite similar to their steamer COAMO, previously described but with certain modifications incorporated.

The principal dimensions are:

Length overall	429 ft.
Length between perpendiculars	414 ft.
Breadth, molded	59 ft. 6 in.
Depth, molded to hurricane deck	35 ft.
Depth, molded at center deck	36 ft.
Draft to designer's waterline	23 ft. 6 in.

At the time of launching the BORINQUEN, the hull structural work, wood and outfitting was about 80 per cent complete. The machinery was about 65 per cent complete, with boilers on board but turbines and reduction gear not on board.

The ground ways were of yellow pine 60 inches wide by 12 inches thick and had a slope of 11/16-inch per foot, with no camber. Although the ways were 60 inches wide, the used width was only 49½ inches, as the ways for the Oceanic liners were used to launch this ship.

The overall length was 541 feet 5 inches and the spread 24 feet 2½ inches, ribband to ribband. The transverse inclination was ¼-inch per foot.

The sliding ways were of yellow pine 48 inches wide by 12 inches thick and had an overall length of 331 feet 8 inches, and an effective length of 323 feet 5 inches. The effective bearing area of sliding ways was 2587 square feet.

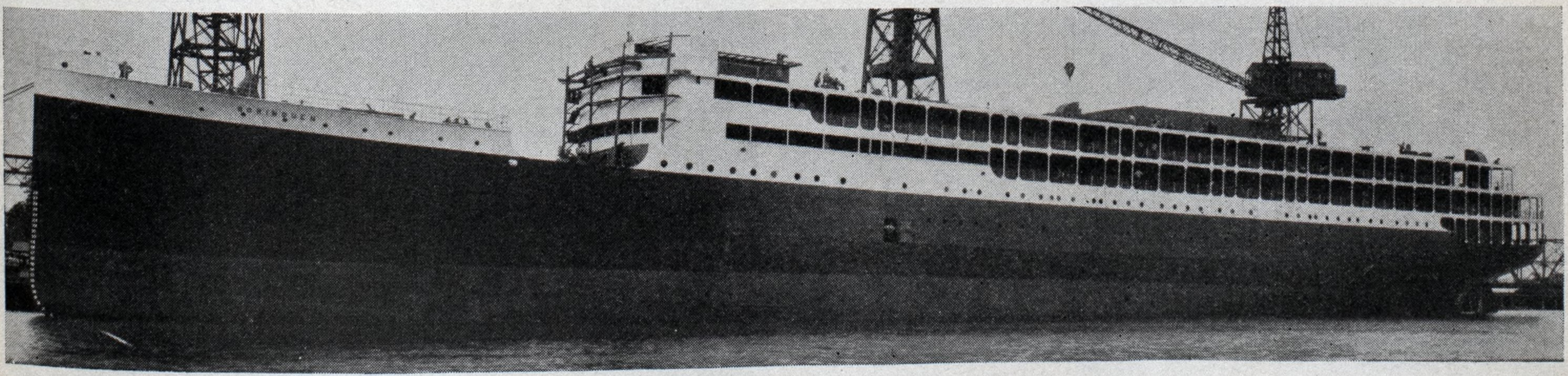
The cradle and packing was in three sections on each side of ship, as follows: The fore poppets proper 12 feet 10 inches long with three plate slings; solid horizontal packing for 246 feet; and the after poppets for 60 feet. The main section of horizontal packing under the middle portion of the vessel was made up of planks 10 inches to 12 inches wide and 2½ inches thick, clamped together so as to form a total width of 48 inches.

The vertical members of the after poppets were placed on frames 142 to 168 inclusive, and each was made up of four yellow pine timbers 12 inches square. No toggles were used but the upper and lower ends were held from spreading by 2-inch diameter solid steel rods, the upper ones leading from steel saddle plates placed under the keel of the ship. The lower rods were continuous and housed in longitudinal angles located near the top of the wedge riders.

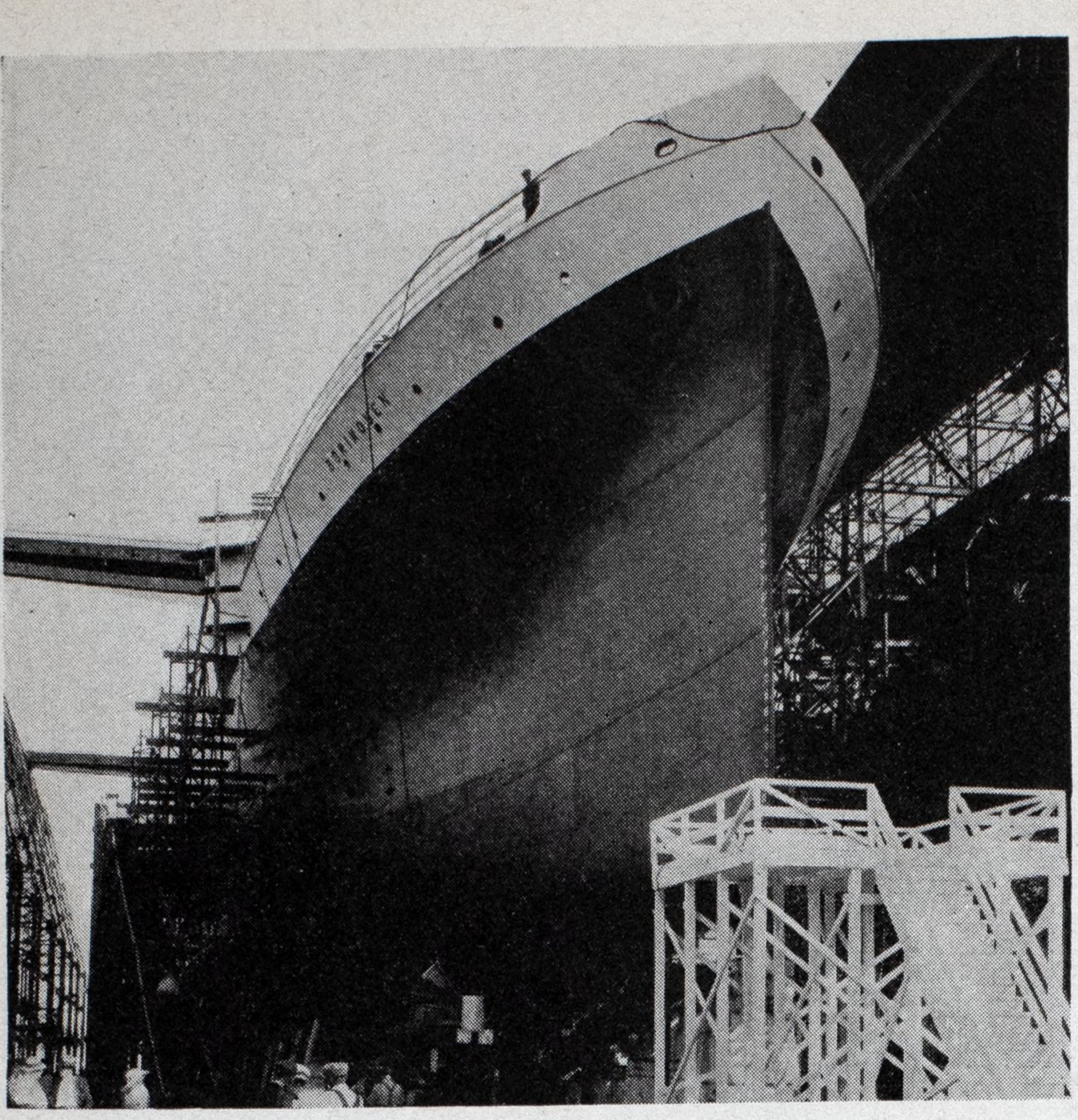
The fore poppet section proper contained three rows of spruce crushing strips arranged in groups with nine forward, eight intermediate and six aft, arranged to distribute the pivoting load evenly over the full length of poppet which they successfully did.

The space above these strips was filled in with spruce stage planks up to the saddle plates. The three steel plate saddles were continuous under the ship, 35 pounds by 40 inches wide, bolted at center, and having 30 pounds flanged face plates to hold the packing. The space between the ship and saddles was filled with a mixture of cement, coke and sand. An eight-inch channel face strap was run diagonally across these poppets. Two 1½-inch diameter bolts were run from clips on saddles through packing to heavy plate gluts on the outside to hold the poppet from spreading. Two 2-inch diameter through tie bolts were run above wedge rider in way of forward saddle. No toggles or rope frapping were used in the construction of the poppets.

Hydraulic triggers, one in each way, cross connected and located near frame 110, were used for releasing the ship. The cylinders were 10 inches diameter, the leverage of triggers was 1.778 to 1, and they were tested to a pressure of 3000 pounds per square inch. Hydraulic pressure could be furnished by two hand pumps, with one air driven power pump in reserve, and the triggers could be pulled back from the engaged position, if



The Borinquen after launching. Built for Atlantic Gulf and West Indies Steamship Co. for New York-Porto Rico run



Bow view of Borinquen on the launching ways at Quincy, Mass.

necessary, by means of water pressure applied to the after side of the pistons. No dog shores were used.

On the day before launching certain of the permanent keel blocks were removed and replaced with collapsible and sand blocks, arranged in a group series, namely; permanent, sand and collapsible, then repeat, for the length of the keel. This arrangement of blocking required but one of three to be split out, so considerable time was

Borinquen Launching Data

Inclination of keel, per foot	⅝ in.
Inclination of ground ways, per foot	11/16 in.
Transverse inclination of ground ways, per foot	¼ in.
Total length of ground ways	541 ft. 5 in.
Depth of water over end of ways	8 ft. 9 in.
Distance traveled to pivoting	438 ft. 0 in.
Width of ground ways—each	60 in.
Width of ground ways effective	49 ft. ½ in.
Width of sliding ways	48 in.
Effective length of sliding ways	323 ft. 5 in.
Effective area of sliding ways—both sides	2587 sq. ft.
Width of packing	48 in.
Launching drafts—with cradle under ship	
Forward	6 ft. 1 in.
Amidships	11 ft. 11 in.
Aft	17 ft. 9 in.
Weight of ship at launch, tons	4585
Weight of cradle, tons	180
Weight of ballast, tons	None
Total weight on grease, tons	4765
Actual pressure on grease, tons per square foot	1.84
Component of weight acting down ways, tons	273
Load on fore poppet at pivoting, tons	545
Maximum way end pressure, tons per square foot	6.7
Drop-off	21 in.
Number of men engaged:	
On ground	162
On ship	35
Total	197
Temperature of air at launch	76° Fahr.
Temperature of water	65° Fahr.
Weather—Fair and warm	
Wind—West by North	

saved in clearing ship after the wedging.

Grease irons were removed on the morning of the launch. Special care was taken to insure the removal of every iron. Racks were provided with numbered pegs to correspond with numbers on grease irons, to allow checking. Before wedging up, the ship was supported by 49 keel blocks and 79 shores. A total of 416 oak wedges, 5¾ inches by 5¾ inches by 66 inches long were required on about 15-inch centers. The load on each wedge was about 11 tons. Internal shoring was provided in way of fore poppet and in the inner bottom in wake of way end pressures.

Propeller blades were unprotected. Propeller and shafting were locked with steel plate brackets and bolts. The rudder was blocked inside with a steel bracket and with yellow pine shores against steering gear head and cylinders.

In order to prevent any portion of the launching cradle from breaking away in the water, and possibly damaging the ship's bottom, the various parts were secured by steel straps, bolts, etc. In addition, a considerable number of tricing lines were carried up to bitts on deck from the various sections of cradle. The fore poppet was removed soon after launching. The after poppet and solid packing were hauled out a few days later, Tuesday, Sept. 30, 1930.

The speed and acceleration of the Borinquen during launching were obtained by a single method. A Denny-Edgecomb chronograph was placed under the launching platform and wired to a contact maker placed well aft on the star board ground way, and the contact maker was operated by steel pins driven into the sliding ways. A satisfactory result was obtained by this single instrument. Owing to the restricted length of the deep water basin, it was necessary to devise some method for checking or slowing the ship, and the simpler arrangement was chosen, namely, slowing.

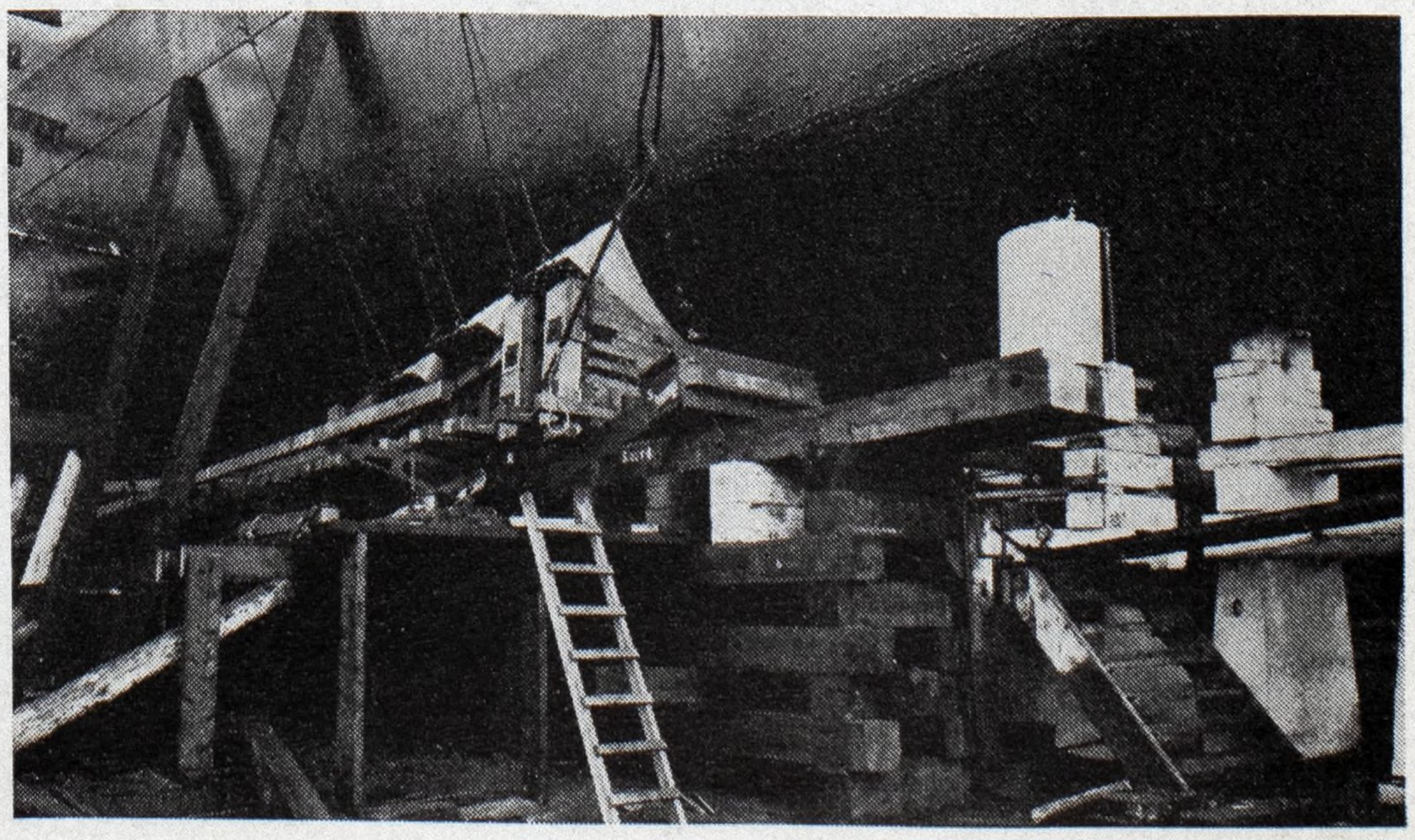
Acordingly, two sets of concrete block drags were arranged and attached to the port quarter by wire

Launching Schedule

Start burning and greasing exposed ways	4:30 am
Start pulling grease irons	5:00 am
Put pressure on triggers	7:00 am
Start removing bilge blocking and shores	7:00 am
Start removing permanent keel blocks	8:00 am
Remove shores in way of ramming	10:55 am
Tugs arrive	11:00 am
First rally on wedges	11:05 am
Second rally on wedges	11:15 am
Third rally on wedges	11:26 am
Remove remaining shores	11:30 am
Shores out	11:37 am
Remove sand and collapsible keel blocks	11:40 am
Collapsible keel blocks out	11:46 am
Sand blocks out	11:50 am
Ship clear and held by triggers	11:55 am
Water over way ends at this time	8 ft. 9 in.
One blast of whistle—all men clear	11:56 am
Two buzzers from stand—preventers released	12:00 m
One buzzer from stand—ready	12:01 pm
One buzzer from stand—release	12:03 pm
Triggers released	12:03–10 pm
Ship starts	12:03–10 pm
Ship afloat	12:03–50 pm
Ship stops	12:05 pm
Ship decked	1:03 pm

ropes. The first set of five blocks of concrete, each weighing 4000 pounds was placed at an angle of about 14 degrees with centerline of ship, and arranged to come into action as the cradle left the ways. In order to prevent a sudden shock, each weight was arranged to come on after the preceding weight had moved 10 feet. The second set of six concrete blocks was arranged to start while the first set was working. The blocks were connected by wire rope pendants and shackles and each block weighed about 4000 pounds. The first drag line was 1½-inch diameter wire rope 300 feet long, set at 14 degrees with centerline of ship. The second was 1⅜-inch diameter wire rope 460 feet long, set at 38 degrees with centerline of ship, so as to create a larger slowing moment.

The ship's stern traveled in a straight line for one length then started to turn, following a curved line practically identical with the path as calculated. The slowing arrange-



Close up near bow showing portion of launching ways and launching cradle

ment worked very satisfactorily.

The clearance given in the accompanying creeping table is for space between trigger and preventer. The ship started the instant the triggers were released. The starting coefficient of friction of the grease worked out from the maximum trigger pressure was less than 1 per cent, which is very low, and shows that the greasing arrangements were completely satisfactory.

Trigger Pressures and Clearances

	Port		Starboard	
Time	Press. Lbs.	Clear. Ins.	Press. Lbs.	Clear. Ins.
9:00 am.....	340	1/8	340	3/32
9:30 am.....	340	1/8	340	3/32
10:00 am.....	340	1/8	340	3/32
10:30 am.....	340	1/8	340	3/32
10:45 am.....	340	1/8	340	3/32
11:00 am.....	360	1/8	360	3/32
11:15 am.....	360	1/8	360	3/32
11:30 am.....	360	1/8	360	3/32
11:35 am.....	500	3/32	500	3/32
11:40 am.....	900	3/32	900	3/32
11:45 am.....	1100	3/32	1100	3/32
11:50 am.....	1800	3/16	1800	3/32
11:55 am.....	1900	1/4	1900	3/32
12:00 m	1900	1/4	1900	3/32
12:03–10 pm.	Triggers released.			

Creeping Table

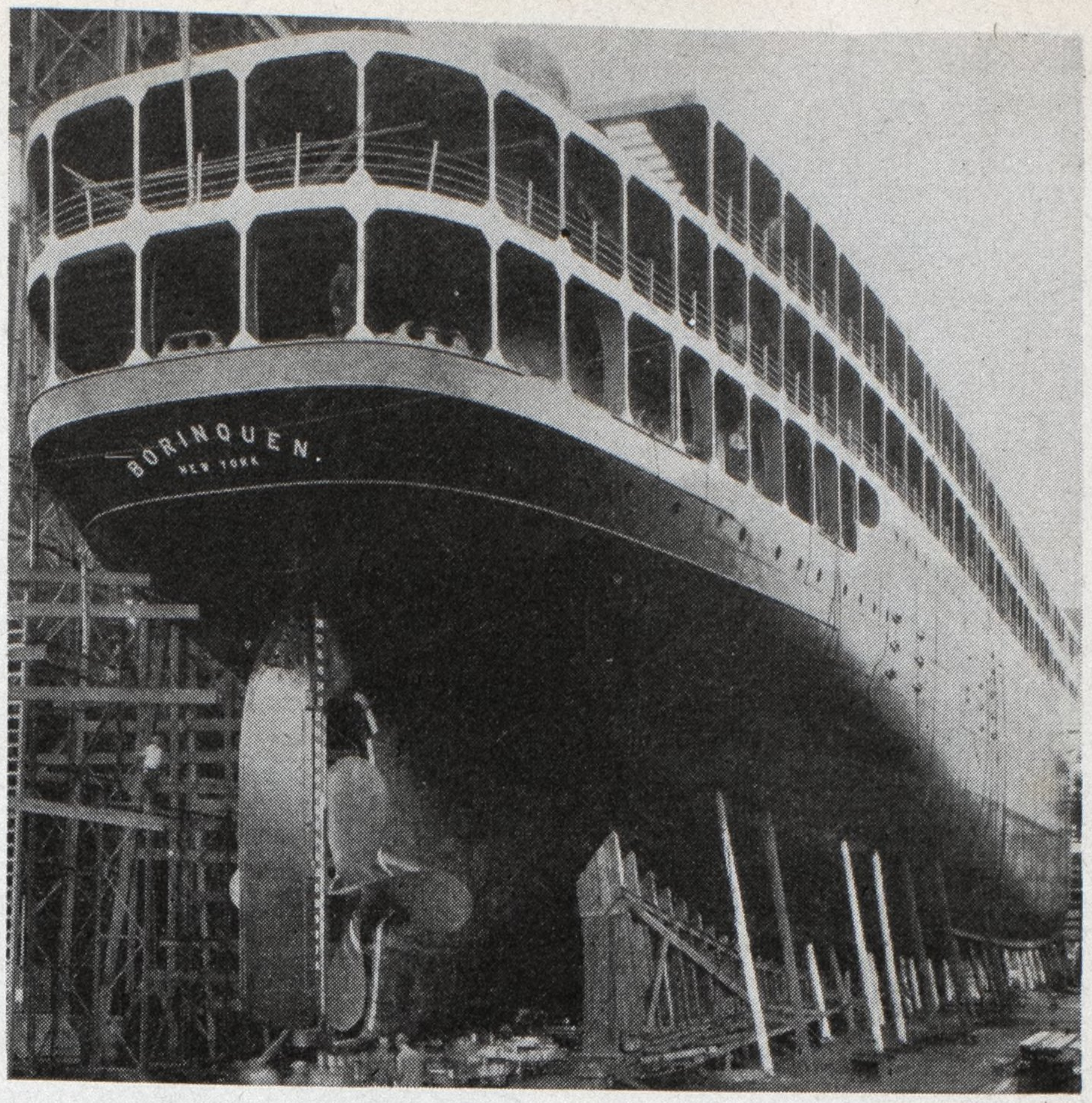
	Starboard		Port	
Time	For'd. Ins.	Aft. Ins.	For'd. Ins.	Aft. Ins.
9:00 am.....	1/32	0	1/32	0
9:30 am.....	3/64	0	1/16	0
10:00 am.....	3/64	+	1/16	+
10:30 am.....	3/64	1/32	1/16	0
11:00 am.....	3/64	1/16	1/16	3/64
11:15 am.....	1/16	1/8	1/16	1/16
11:30 am.....	1/16	3/16	1/16	1/8
11:45 am.....	3/8	1/2	1/4	1/4
11:50 am.....	5/8	11/16	1/2	1/2
12:00 m	7/8	15/16	9/16	9/16

Four indicators were used, two forward and two aft.

The above table shows that the cradle stretched very little.

Holds Trials of New Tug

Trials were completed, Oct. 8, of the new steel diesel tug PRESCOTONT, described in the October number of MARINE REVIEW. This vessel was built by the Davie Shipbuilding & Repairing Co. Ltd., for the Canadian Pacific Car & Passenger-Transfer Co. Ltd., and was designed, as was also the car float OGDENSBURG to be operated with it, by the Canadian firm of naval architects, Lambert & German, Montreal. Construction of the tug and car float was supervised by this firm. Mr. German of the firm attended the launching of the car float at the Lorain yard of the American Ship Building Co., Aug. 30. The tug was launched Sept. 11.



Stern view of new Porto Rico liner showing rudder and single propeller

Concludes Hearings on Sale of Shipping Board Lines

The shipping advisory committee appointed by President Hoover in August to study the controversy surrounding the proposed sale by the shipping board of the America France and American Diamond lines concluded its hearings on Oct. 9. The inquiry, which included both private and public hearings, began on Sept. 29 and was conducted at 45 Broadway, New York. While no definite announcement has been made, it is expected that the committee will present its report to the President in the immediate future.

Great interest has been manifested in these hearings and shipping men not directly affected have been attracted as many inner details of maritime conditions were touched upon in the questions asked by Ira A. Campbell, chairman, and other members of the board. The arguments presented on both sides were forceful and far-reaching and the outcome of the case is awaited with interest. Sherman Whipple, well known attorney who died suddenly on Oct. 20, acted as counsel for the United States lines; Henry Herrick Bond for J. E. Dockendorff, president of the Black Diamond Steamship Corp., operators of the American Diamond line; Louis Titus for A. F. Mack, president of the Cosmopolitan Shipping Co., operators of the America-France line.

Second Arc Welding Prize Competition is Announced

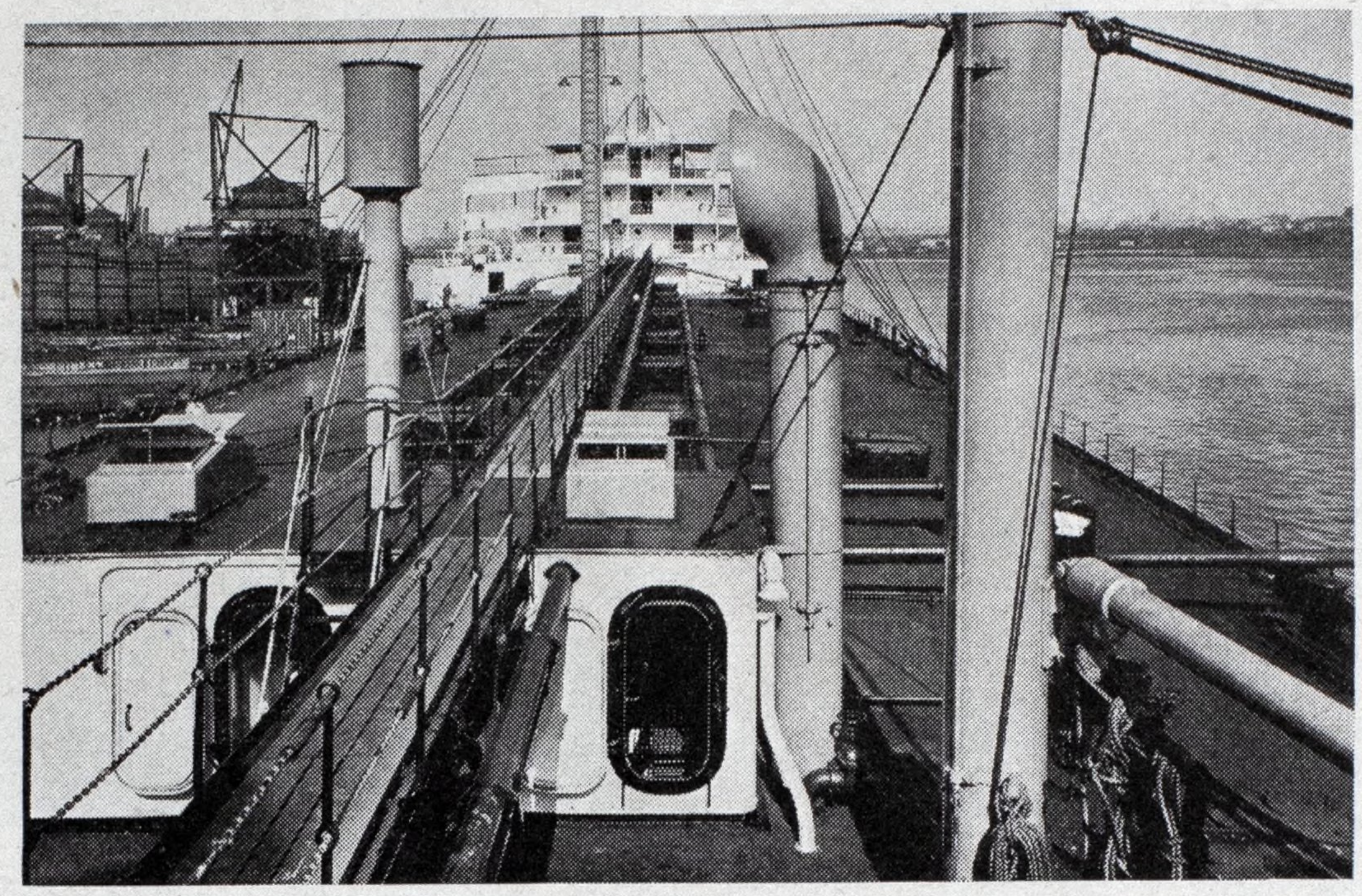
Designers and engineers in every industry where iron and steel forms all or a part of the manufactured product, are again given the opportunity by the Lincoln Electric Co., Cleveland, sponsors of the second Lincoln arc welding prize competition, to show their skill and ingenuity in utilizing the advantages of arc-welded construction. An award of $17,500 will be made for the 41 best papers submitted in the competition. In announcing the competition, the second to be sponsored by the company, the sponsors are establishing a biennial competition. The purpose of the competition is to stimulate designers and engineers in every line of industry to think of the manufacture of their own products by the use of arc welding and to increase their knowledge of the feasibility of its application.

The 41 prizes for the winners as selected by the jury of awards, are: First prize paper, $7500; second prize, $3500; third, $1500; fourth, $750; fifth, $500; sixth, $250; and for the seventh to forty-first prize papers $100 each. The competition as announced will be open to any person in the world except the employes of the sponsors. The closing date for the competition will be Oct. 1, 1931.

Close up at stern showing launching cradle in more detail

High Pressure Steam Used in Tanker

Double Reduction Geared Turbine—High Pressure and Temperature—Low Fuel Consumption—Decided Advance in Design—Excellent Performance on Sea Trials


Looking Forward to the Bridge—Tanker G. Harrison Smith

ON OCT. 8 the tanker G. Harrison Smith, built by the Federal Shipbuilding & Dry Dock Co. for the Standard Shipping Co., a subsidiary of the Standard Oil Co. of New Jersey, completed successful builder's trials at sea. The trials went off without untoward incident and all on board, including the owner's representatives were well satisfied with the performance of the ship. This tanker is the first of two for the same owner; the second named the W. S. Farish was launched Oct. 11, and will probably be ready for service by the first of the year. These tankers represent an exceptional advance in applying modern marine steam engineering. A high speed, efficient, compound, steam turbine delivers power to a single propeller at 75 revolutions per minute by means of double reduction gears. High temperature, high pressure steam generated in oil burning watertube boilers give a most efficient steam plant.

General particulars of the vessel are tabulated for convenience. Though final figures from the trial run are not available, the indication is that a marked improvement in economy has been effected by the progressive engineering used in these ships.

Nothing has been spared, not only in machinery but in the hull and its equipment to make this tanker outstanding. The total cost is about $2,000,000. She has been constructed under special survey to the highest class for her type in the American Bureau of Shipping. All requirements of the United States steamboat inspection service and the recently enacted load line law have been complied with. The hull is constructed on the Isherwood bracketless system of longitudinal framing under supervision of owner's representatives.

Tanker G. Harrison Smith
General Particulars

Owner	Standard Shipping Co.
Builder	Federal Shipbuilding & D. D. Co.
Launched	July 12, 1930
Completed	Oct. 8, 1930
Classification	American Bureau of Shipping
Length overall, feet, inches	544 0
Length between p. ps., feet, inches	525 0
Breadth, molded, feet, inches	74 0
Depth molded, feet, inches	40 6
Draft, loaded, feet, inches	30 7½
Deadweight, total, tons	20,600
Construction	Isherwood Bracketless System
Bunker fuel capacity, tons	1382
Cargo capacity, barrels	154,000
Dry cargo space (bale), cubic feet	52,034
Propellers	Single Screw
Main Drive, De Laval geared turbine, s.h.p.	4000
Revolutions of propeller normal	75
Gearing, De Laval	Double Reduction
Boilers, watertube, two, oil burning, Babcock & Wilcox, maximum pressure per sq. in.	420
Oil burners, 4 each boiler	Todd
Auxiliary Generators—Two, 300 k.w. each, De Laval turbines, Westinghouse generators; One 175 k.w. Westinghouse driven from main turbine; Two 25 k.w. each motor generators Westinghouse.	
Pumps, cargo, Northern	Three
Pumps, ship service, generally	Worthington
Steering gear, hydro electric	Hyde
Rudder, streamline	Oertz-Federal
Refrigeration, two tons	Brunswick-Kroeschell

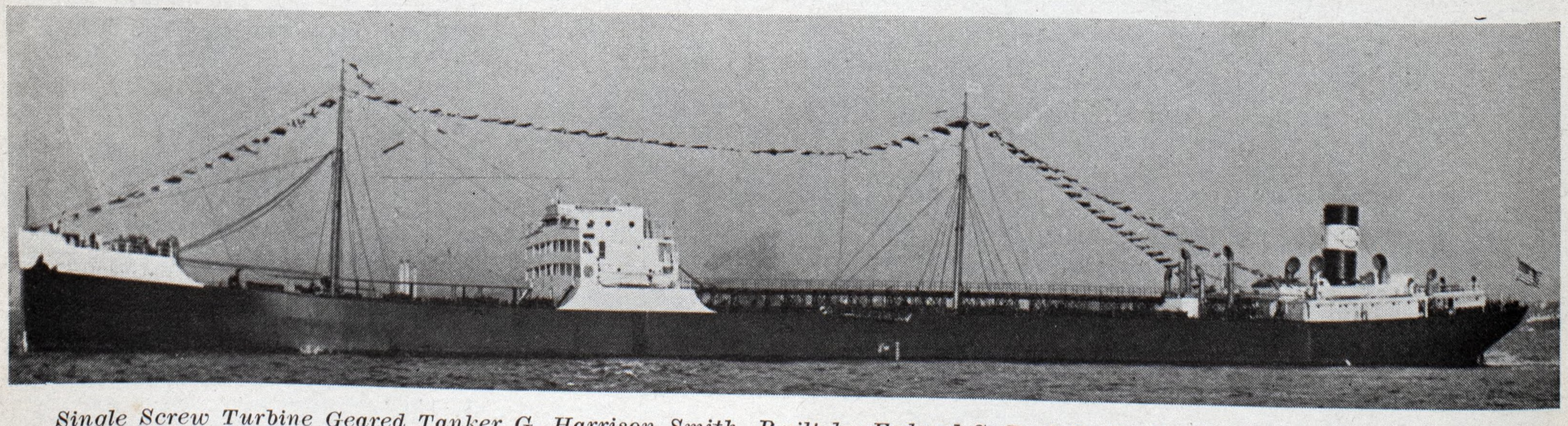
For handling cargo there are two suction lines of 12-inch pipe, one on each side of the centerline bulkhead, each line having a 10-inch branch to each main tank. A 6-inch stripping line is also fitted in the main tanks with a 6-inch branch to each main tank. Summer tanks are fitted with an 8-inch line and an 8-inch branch to each tank. A separate 10-inch discharge is taken from each main pump to deck, with discharge branches to port and starboard forward of the pump and about amidships. Heater coils of seamless steel pipe with electric welded joints are fitted in the main cargo tanks in the ratio of one square foot of heating surface per 125 cubic feet in the fuel oil tanks in the ratio of one square foot of heating surface per 100 cubic feet.

The windlass of spur geared type driven by a 75-horsepower General Electric motor is supplied by Allan Cunningham. Three electric warping winches driven by 25-horsepower General Electric motors were also furnished by the same manufacturer.

The steering gear of hydro-electric two-cylinder type with 12-inch rams, dual pumping unit of Waterbury pumps and 20 horsepower Westinghouse motors and Sperry electrical telemotor control, was furnished by the Hyde Windlass Co.

The ship has two bower anchors of 12,740 pounds each, one spare bower anchor of 10,815 pounds, one stream anchor of 4550 pounds and 300 fathoms of 2¼-inch diameter, wrought studlink anchor chain. All of this equipment was furnished by the Baldt Anchor, Chain & Forge Co.

Lifeboat equipment consists of four 24-foot 30-person metallic lifeboats stowed under Welin quadrant type davits. Boats and davits were manufactured by Welin Davit & Boat Corp.


Single Screw Turbine Geared Tanker G. Harrison Smith, Built by Federal S. B. & D. D. Co. for Standard Shipping Co.

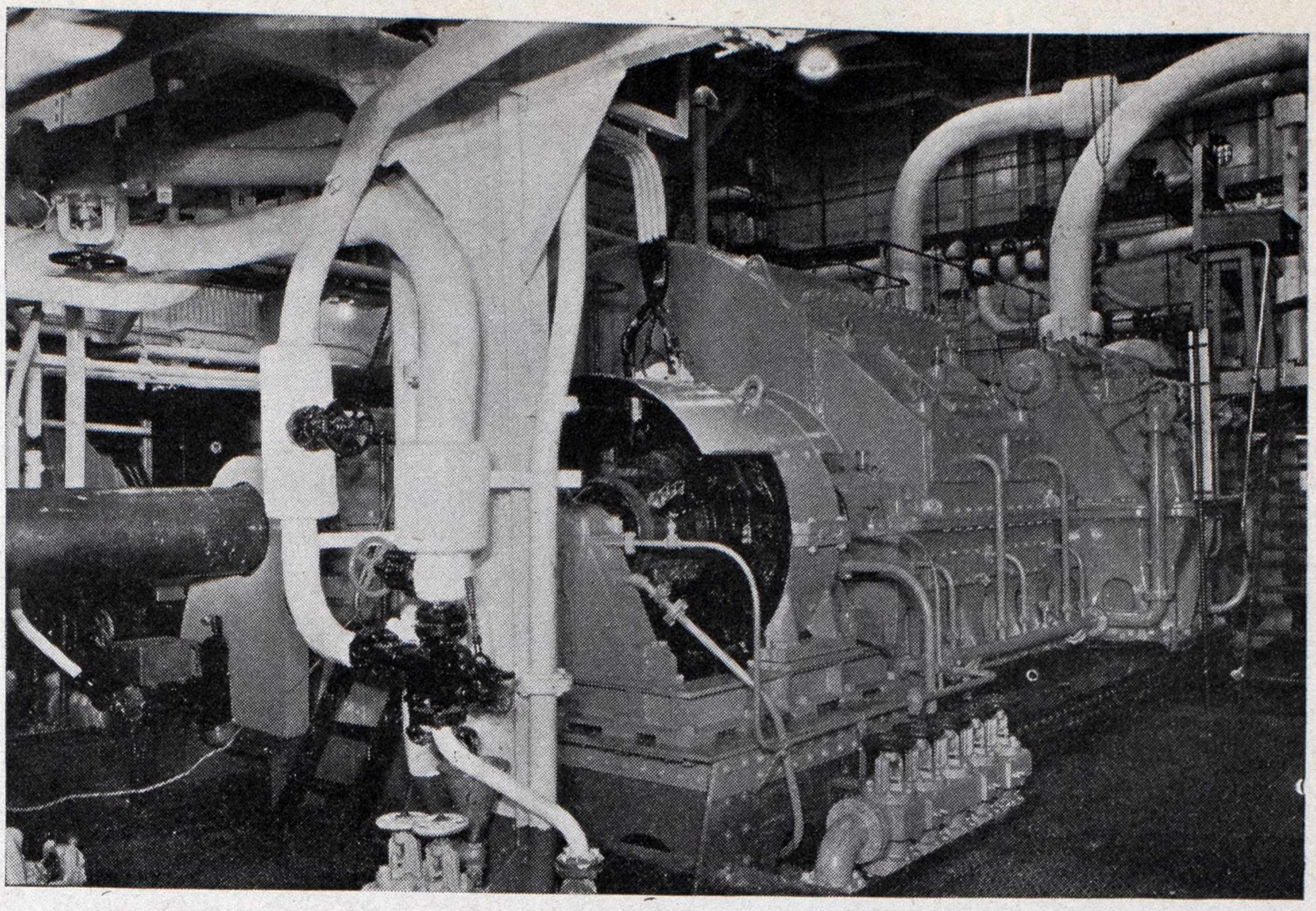
The accompanying illustration showing the deck arrangement indicates the great experience and care exercised by the representatives of the owner to have a vessel superlatively fitted in every respect for efficient operation. It is important to stress that the art of tanker building has reached its highest peak in the United States. This country probably leads the world in tanker design and construction. But remarkable as this ship may be in hull structure and equipment, her chief interest lies in the fact that a definite move has been made to get away from the usual customary, old-fashioned, low pressure, low temperature machinery for ship propulsion.

Why, reasoned the engineers of the shipyard and the owner, with many stationary plants ashore operating at high pressures and high temperatures with high economies, cannot higher pressures and higher temperatures be applied on board ship? In the G. Harrison Smith this has been worked out almost in accordance with what might be called an engineer's dream.

The propelling machinery, located aft, consists of a De Laval compound type steam turbine unit driving a single screw through double reduction gearing. The normal shaft horsepower delivered to the propeller at 75 revolutions is 4000. Maximum horsepower delivered to the propeller at 77½ revolutions per minute is 4400. The high pressure turbine operates at 5430 revolutions per minute and the low pressure turbine at 4270. The turbine takes steam at 400 pounds gage pressure at a temperature of 750 degrees Fahr. The two Babcock & Wilcox watertube boilers each has 5080 square feet of heating surface. Each boiler, integral with it, also has a superheater of 704 square feet of heating surface raising the steam temperature to 750 degrees. There is also an air heater integral with each boiler of 3450 square feet of heating surface which raises the air temperature from 90 to 310 degrees Fahr.

Each of the two boilers is fitted with four Todd oil burning air registers and mechanical pressure atomizing burners. There is also duplicate oil heating and straining apparatus of the same system of standard marine equipment. The air registers are of the double casing insulated type for high temperature air and for forced and induced draft. Capacity of burners is sufficient to amply meet the high evaporative capacities required. The evaporation under normal conditons is about four pounds of water per square foot of heating surface. This increases to 6.25 pounds under maximum conditions from and at 212 degrees Fahr. The anticipated overall boiler efficiency is 86.6 per cent, which is exceptionally good.

The economies possible by careful operation on a ship like the G. Harrison Smith is a very definite challenge, when the comparative price of fuel is taken into account, to the possibilities with diesel engine drive.

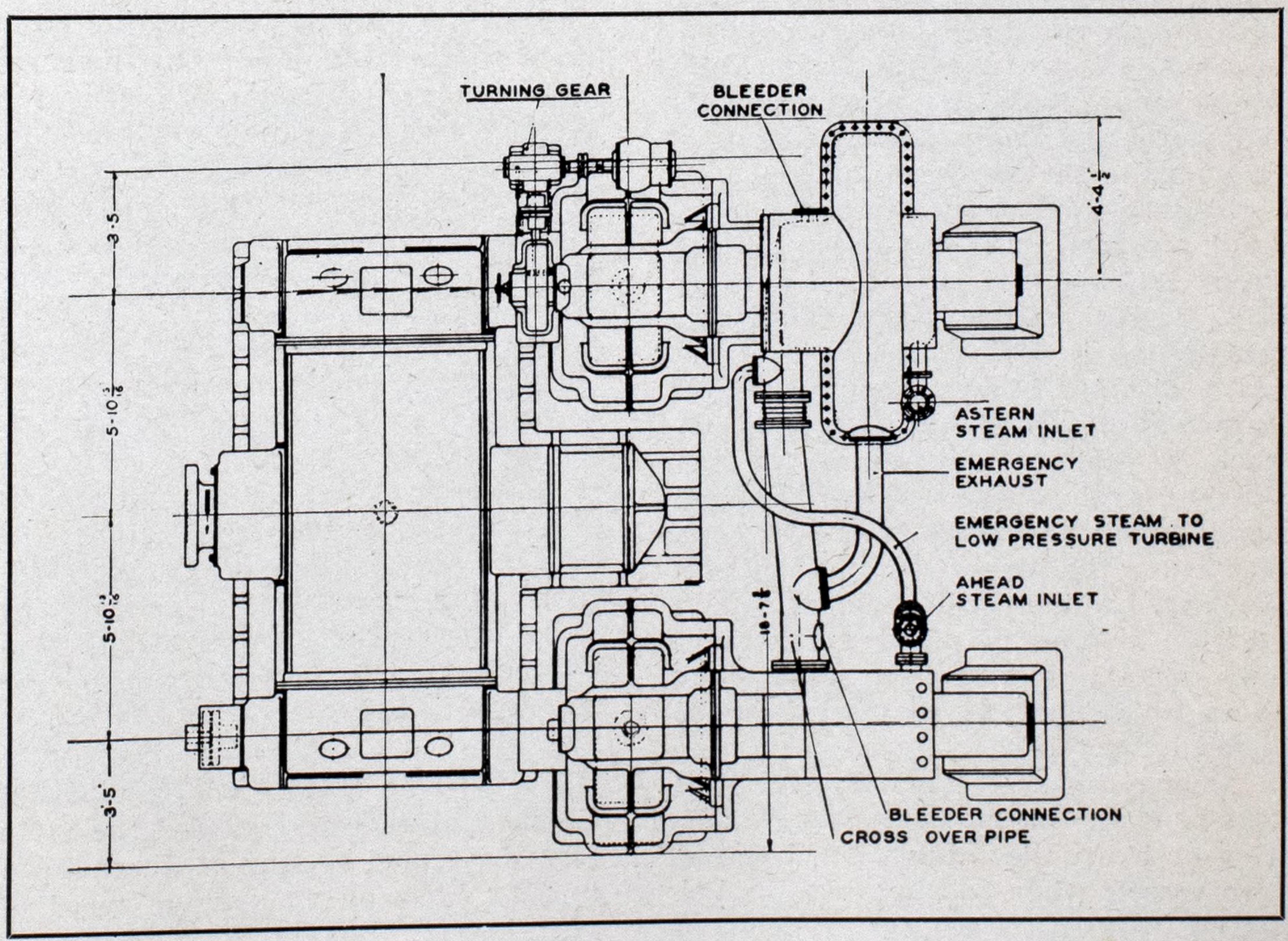


Engine Room, Tanker G. Harrison Smith—De Laval Turbines—Double Reduction Gears

The latest navigational equipment has been installed, including a Sperry gyro compass and gyro pilot and helm indicator. A radio direction finder is fitted.

Many pumps are fitted and may be briefly summarized as follows: Two, 200 horsepower electric motor driven, 2000 gallons per minute capacity each, of horizontal rotary type supplied by Northern Pump Co. These mammoth pumps are located in the pump room and the driving motors in the engine room connected by shaft through bulkhead. Most of the ship's service pumps, including main circulating pump of centrifugal type of 5000 gallons per minute capacity driven by a 50 horsepower motor, main condensate pump, main booster pump, main drain pump, auxiliary circulating pump, auxiliary condensate pump, sanitary, fire, bilge evaporator feed, lubricating oil cooler circulating, bilge and ballast forward, main feed, auxiliary feed, make-up feed, drinking water, standard service and transfer pumps were all furnished by Worthington Pump & Machinery Corp.

Two lubricating oil coolers of straight tube type 350 square feet each were supplied by Griscom-Russell. There is one lubricating oil purifier of Sharples type. Feed heating equipment, evaporator and control equipment and drinking water distiller set were all supplied by Davis Engineering Corp. Fans for induced and forced draft were supplied by Sturtevant. Both the main and auxiliary condensers were supplied by Foster-Wheeler.



Layout of Main Turbines and Gears in Tanker G. Harrison Smith

John Fritz Medal Awarded Rear Admiral Taylor

THE John Fritz gold medal, highest honor of the engineering profession in America, has been awarded for 1931 to Rear Admiral David Watson Taylor, retired, "for outstanding achievement in marine architecture, for revolutionary results of persistent research in hull design, for improvement in many types of warships and for distinguished service as chief constructor of the United States navy during the World war."

The award was made unanimously by the John Fritz Medal Board of Award, composed of four representatives each of the four American societies of civil, mining and metallurgical, mechanical and electrical engineers.

Recent recipients of the medal included Ralph Modjeski, Herbert Hoover, John J. Carty, Elmer A. Sperry, Edward Dean Adams, John F. Stevens and Ambrose Swasey, the latter being the founder of the Engineering Foundation. Among Admiral Taylor's most notable achievements, and one of "untold usefulness to the entire shipping world," according to announcement by the board, was his work on hull lines, involving years of painstaking experimentation, by which resistance was so greatly reduced that a tremendous saving was made in the fuel bill of the United States navy. The principle of hull design so successfully introduced to the navy by Admiral Taylor has since been adopted by every navy in the world and more recently has been extended to the merchant marine.

D. W. Taylor

Admiral Taylor, born in Virginia in 1864, attended Randolph-Macon College from 1877 to 1881, and then entered the United States Naval academy, graduating in 1885 at the head of his class with the highest honors ever attained there up to that time. He then took a post-graduate course at the Royal Naval college, Greenwich, England, which he completed in 1888. His mark was the highest obtained by any student, English or foreign, who had entered courses of naval architecture and marine engineering since they were established at the Royal Naval college about 1873.

Among investigations by Admiral Taylor at the model basin was the suction or hydraulic interaction, between two vessels when passing. In the litigation resulting from the collision of the Atlantic liner OLYMPIC and the English cruiser HAWK off Cowes, England, in 1911, he was retained by the British admiralty as an expert witness on the question of suction, the British government making the request of the United States government. The court accepted his testimony and decided in favor of the admiralty, a decision which was sustained in the British courts of last resort.

During 1912 to 1913 he started experiments for exact information on aerodynamic forces. Pioneer work in 1905 on ventilating fans and pipes, together with his knowledge of hydrodynamics, had prepared him for aerodynamic work. He accordingly built one of the first wind tunnels in this country, for some years the largest and most powerful in the world.

Admiral Taylor was appointed chief of the bureau of construction and repair of the United States navy in 1914, and rear admiral in 1917. As chief constructor, he initiated aeronautical development work. In 1918, foreseeing the possibility of an acute shortage of shipping facilities to Europe, he inaugurated the design of a giant flying boat which could proceed to Europe by air.

This resulted in the first flight across the Atlantic in 1919 of the NC-4, eight years before Lindbergh's journey in a commercial plane. During the World war, he was a member of the Aircraft Production board and his foresight again took the form of initiating work on a naval airship design after the Armistice. The SHENANDOAH was designed under his direction, the building of the ship being completed by the newly formed bureau of aeronautics. The utilization of the model basin for the evolutions of forms of flying boat hulls and seaplane pontoons was another of his creative achievements. As a result, American naval types of plane floats have set the standard and have been extensively copied throughout the world.

Admiral Taylor is an honorory doctor of engineering of Stevens Institute of Technology, a doctor of science of George Washington university, and a doctor of laws of Randolph-Macon college and of Glasgow university. He was the first American honored by the British Institution of Naval Architects with its gold medal.

He is a past president and an honorary member of the Society of Naval Architects and Marine Engineers; vice-chairman of the national advisory committee for aeronautics, and a commander of the Legion of Honor of France. The United States bestowed upon him its distinguished service medal for exceptionally meritorious service as chief of the bureau of construction and repair during the war.

The White Star line motorship BRITANNIC recently made the trip from Liverpool by way of Queenstown to New York on an average speed of 17¾ knots. Captain F. F. Summers, R.N.R., is master of the BRITANNIC.

Designer of Machinery for American Navy Dies

Rear Admiral Charles W. Dyson, U. S. N., who designed the machinery plans for every American war vessel now in service, died in the Naval hospital, Washington, on Oct. 25, at the age of 69. He was a native of Maryland and graduated with honors from the naval academy in 1883.

Next to Admiral D. W. Taylor, Admiral Dyson was generally regarded as the most distinguished engineer officer in the navy. During his service as chief designer and head of the design division, machinery plans for all of the vessels of the United States navy now in service were designed under the direction and supervision of Admiral Dyson. These included capital ships beginning with the U. S. S. DELAWARE and ending with the SARATOGA and LEXINGTON; the light cruisers of the RALEIGH class, with horsepower increasing from 25,000 to 212,300 and destroyers, which increased from 10,000 horsepower to 30,000 horsepower. During the period the propeller work for which the Distinguished Service Medal was awarded to Admiral Dyson was perfected.

C. W. Dyson

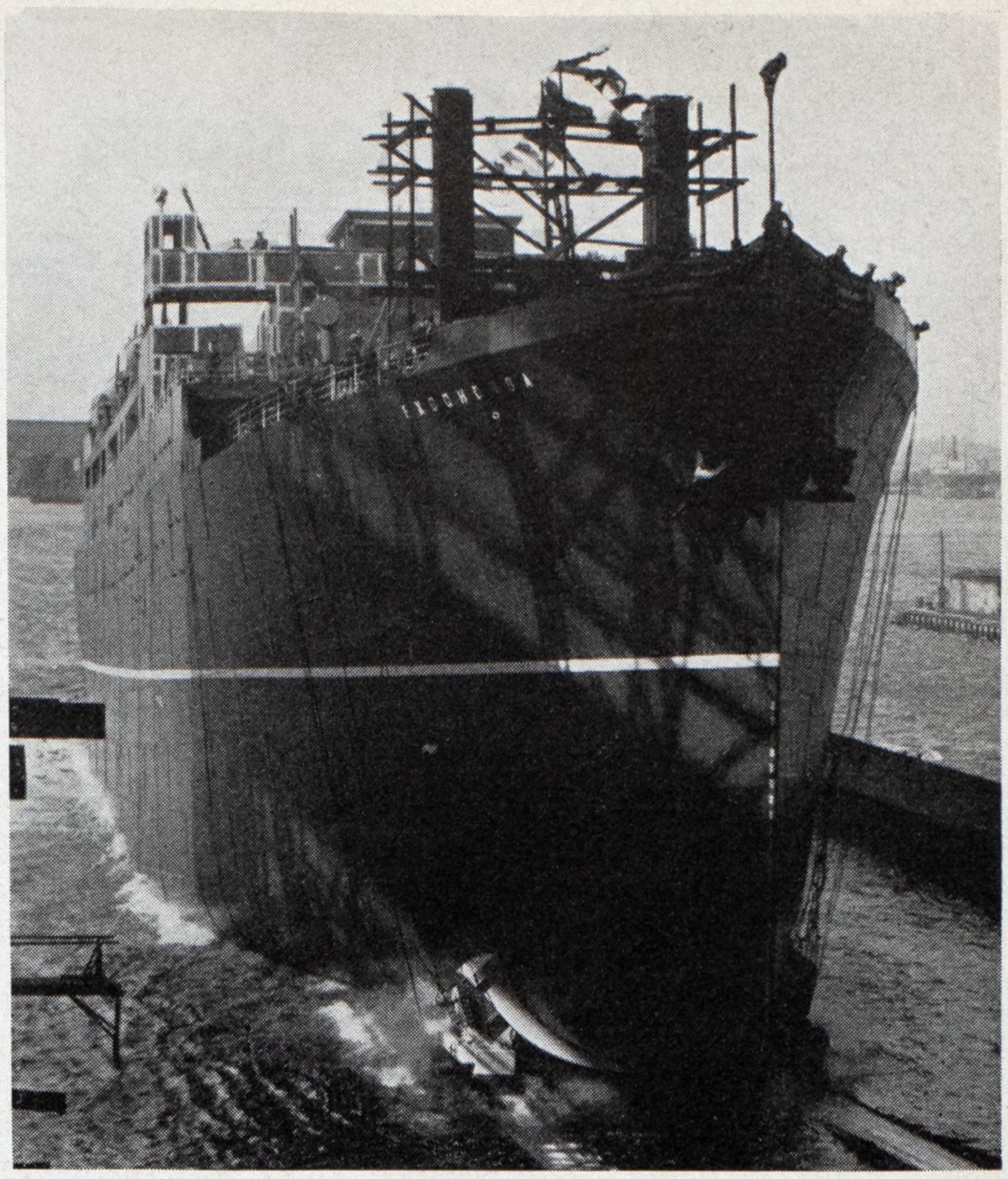
The final proof of his work on the propellers was not demonstrated until 1927 with the success of the new propeller installed on the LEVIATHAN, which was followed the next year by the success of the propeller of the aircraft carrier LEXINGTON.

Admiral Dyson retired on Dec. 2, 1925, upon reaching the statutory retirement age. In March, 1926, he was appointed to the Naval War Claims board, navy department, where he was serving at the time of his death.

Bremen Breaks Own Record in Westward Crossing

When the North German Lloyd liner BREMEN arrived in New York on Oct. 9 she had broken her own speed record by 6 minutes and was within 12 minutes of the world's record for the westward trans-Atlantic crossing set by her sistership, the EUROPA. The record of the EUROPA was made under ideal weather conditions but the BREMEN encountered heavy weather and fog during the early part of her trip. She made the crossing from Cherbourg in four days, 17 hours and 18 minutes.

Exochorda is Launched at Camden Yard



S. S. Exochorda leaving the ways of New York Shipbuilding Co., Camden, N. J. Second of four new Export Steamship Corp. vessels

THE new passenger and cargo steamship EXOCHORDA, second of four vessels ordered by the Export Steamship Corp., for its service between New York, Mediterranean and Black Sea ports, was launched at 10:45 a.m., Oct. 18 from the yard of the New York Shipbuilding Co. at Camden, N. J.

The sponsor on this occasion was Miss Frances Glover, daughter of Assistant Postmaster General and Mrs. W. Irving Glover of Washington, D. C. Miss Glover is the great granddaughter of John Englis, who was a prominent builder of clipper ships in the days before the civil war, when Young America out-designed, out-constructed, out-sailed and out-traded all other nations. Back in 1859, John Englis made the statement that the only way an American merchant marine could be maintained on the seven seas was by mail subventions which should be handled through the post office department. Miss Glover is a student at Friends school in Washington.

The EXOCHORDA was contracted for on Aug. 31, 1929 and the keel laid Nov. 25. Her sister ship, the EXCALIBUR, christened by Mrs. Herbert Hoover on Aug. 5, and described in the Sept. issue of MARINE REVIEW, is now nearing completion at the Camden yard and will be delivered before the first of the year. The keel for the third ship, the EXETER, was laid Aug. 11 of this year, and that for the EXCAMBION, the last to be built under the contract, will be put down Oct. 25 on the ways made vacant by the launching of the EXOCHORDA.

The order for these ships when placed with the Camden yard constituted one of the largest single contracts for new vessels awarded since the post war slump and was considered as the entering wedge in the new era of shipbuilding which has developed in this country as a result of the Jones-White act. As a result of this legislation there are at present 40,000 workmen who are gaining a livelihood from shipbuilding. Contracts already awarded alone insure that this activity will continue for the next two years.

The EXOCHORDA has an overall length of 475 feet, beam molded 61 feet 6 inches, depth molded to shelter deck 42 feet 3 inches, and is an 8700 gross ton vessel. She will be one of the most modern combination carriers ever built in this country, fast, comfortable and constructed in accordance with the provisions of the International Conference on Safety of Life at Sea. The hull is of the flush-deck type, built with a raking bow and overhanging stern. The ship will have a cargo capacity of approximately 6000 tons. For the carrying of perishable freight, 34,000 cubic feet of refrigerated space is provided. The passenger accommodations are to be of the highest type for a one-class vessel and will provide for 152 first class passengers. The arrangement of these quarters is to be of a somewhat new character for ships built in this country and will be on what is known as the "saw-tooth" plan, which makes all staterooms outside rooms. Each stateroom will be of modern design and installation of hot and cold running water, shower or tub bath, all metal beds, etc.

The propelling machinery consists of Parsons type, triple series single reduction steam turbines, designed to develop 8000 horsepower and produce a ship speed in excess of 16 knots. These units have been built by the New York Shipbuilding Co. and the installation provides a fine example of modern efficient marine machinery. Steam at 350 pounds pressure and 200 degrees of superheat will be furnished by four oil fired, water-tube boilers having a total heating surface of 16,000 square feet.

Miss Frances Glover, daughter of assistant postmaster general

The vessel will be fitted with a complete electric galley serving a dining saloon of sufficient capacity to accommodate all passengers at one sitting.

The most up to date navigating instruments will be found on board, including a gyrocompass, gyropilot, radio direction finder and a high powered wireless set having a capacity of maintaining continuous communication with shore during the voyage from New York to Gibraltar. The life saving equipment is to be of the latest type to meet the requirements of the international safety convention. Fire protection will be provided by a CO_2 system and the passenger quarters will be covered by an automatic fire alarm system.

Following the launching of the vessel, the New York Shipbuilding Co. was host at a luncheon given in the Walt Whitman hotel. Miss Glover's party and many government officials from Washington, as well as representatives of the Export Steamship Corp. and invited guests, were present. Short speeches were made by W. Irving Glover, assistant postmaster general; S. S. Sandberg, shipping board commissioner; Congressman F. R. Lehlbach, chairman of the house committee on marine and fisheries; Congressman Charles A. Wolverton; Rear Admiral L. A. Bostwick, United States navy; Henry Herbermann, president of the Export Steamship Corp., and C. L. Bardo, president, New York Shipbuilding Co.

Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review

By Harry Bowne Skillman

Attorney at Law

UNDER a provision in a charter party that the ship shall not be answerable for any loss or damage arising from any latent defect in the machinery not resulting from want of due diligence by her owners, the ship is not excusable for a latent defect which existed at the beginning of the voyage.—IOSSIFOGLU, 32 F. (2d) 928.

* * *

DAMAGES for improper delay in transporting cargo are measured by the difference between the market value at the time when the goods should have arrived and their market value on actual arrival. This rule is applicable though the cargo consists of goods usually sold afloat, as in the case of raw sugar.—IOSSIFOGLU, 32 F. (2d) 928.

* * *

A PROVISION in a contract of affreightment, "expected time of loading, late March/early April," amounts to nothing more than a representation. It does not amount to a warranty, as there is not definite statement as to the time of loading; "to expect" meaning to look forward to as certain or probable. The "expected" does not always happen.—Petroleum Export Corp. v. Kerr Steamship Co., 32 F. (2d) 969.

* * *

IN THE case of City of Los Angeles v. Standard Transportation Co., 32 F. (2d) 988, the court held both vessels involved in a collision equally at fault in not hearing or giving proper signals, it appearing that the morning was clear, with only a moderate breeze; that the vessels were in plain slight of each other, little, if any, more than half a mile apart; and that no excuse whatever was offered by either vessel for failure to hear the signals given by the other, or for failure to give the proper signals in return. The duty to answer a signal promptly is as imperative as the duty to give one.

* * *

THE duties of a municipal pilot are not completely those of the master, and the authority of the master is not superseded or suspended by the presence of the pilot. He still remains master in full charge of the vessel and crew, it was declared in the case of City of Los Angeles v. Standard Transportation Co., 32 F. (2d) 988, and upon him rests the responsibility for the safety of the ship and all on board. It is the duty of the master to see that there is a sufficient watch on deck, that the men are attentive to their duties, and that signals are properly heard and given. A municipal pilot, though in the general employ of a city, is engaged in the work of the ship or master, and the only control to which he is subject is that of the master. Therefore, there is no liability on the part of the city for a collision through the fault of the said pilot.

* * *

WHERE a vessel has been employed for a service at a fixed compensation, and where the only services performed were those contemplated by the engagement, there are no grounds for a claim for salvage by the crew.—McKnight v. New Orleans Coal & Bisso Towboat Co., 36 F. (2d) 428.

* * *

EVIDENCE in the case of K-3696, 36 F. (2d) 430, showed that the vessel was licensed for "party and work," that illegal liquor was found on board, and that the owner of the vessel knew of the liquor's presence. The court said that by a license for "party and work" was meant that the boat was licensed to take shipping parties for general work, but not for the transportation of freight, and held that the evidence justified forfeiture of the vessel.

* * *

SHIP'S logs are competent evidence against her in a libel for injury to cargo.—WAALHAVEN, 36 F. (2d) 706.

* * *

TUG owes a certain duty to its tow. It is the motive power, and, so far as it can do so, it must protect its tow from the perils of navigation.—JOHN E. ENRIGHT, 36 F. (2d) 821.

* * *

WHERE, as in the case of CRISTOBAL COLON, 36 F. (2d) 825, there was not any notice given of the accident to a vessel, or any notice of any survey for the alleged damage claimed to the vessel, the burden cast on the libelant of establishing its claim is very heavy, and the court must scrutenize the evidence with especial care in order to avoid possible injustices to the parties against whom claims for damage are made.

* * *

IN A PROCEEDING by a vessel owner to limit liability for sinking a barge, causing the death of the master and his family, though the burden of proof of seaworthiness is on the owner, if seaworthiness be not established, the claimant must still prove a casual connection between unseaworthiness and the sinking; if unseaworthiness be shown to be a cause of the sinking, the burden shifts to the owner to establish that unseaworthiness was without its knowledge or privity; presumption of unseaworthiness only arises when the vessel sinks from unknown causes, under such circumstances that nothing but unseaworthiness can explain the accident.—In re Eastern Transportation Co., 37 F. (2d) 355.

* * *

SINCE neither the characters nor bills of lading presented in the case of Grammer Steamship Co. v. James Richardson & Sons Ltd., 37 F. (2d) 366, specified time of delivery of grain transported from Port Arthur-Ft. William, Ontario to Buffalo, the court held that the general rule in admiralty applies, to wit, in the performance of the contract in a reasonable manner and the prosecution of her voyage to the port of delivery, before earning the stipulated freight, the carrier was required to use due diligence to foresee and anticipate the customary weather conditions at the Soo in early December, and make efficient effort to overcome any obstructions to her arrival within a reasonable time. Resort to extraordinary means to keep the ice and sleet from forming a barrier or blockade, as distinguished from diligent effort to progress the voyage when confronted with difficulty, was not required. It is often difficult to determine the measure of reasonable diligence or reasonable time of delivery, since shipments by water are controlled by conditions relating to accidents of one kind or another, storms, collisions, etc., and in inland waters, especially on the Great Lakes, blockades of ice in harbors and channels forming in the month of December, which may or may not be breakable by the use of instrumentalities or the power of the vessel for continuance of the trip. Although carriers ordinarily insure the safety of the goods transported, and are liable to the shipper for damage sustained, unless delivery is prevented by vis major, or public enemy, or an act of the shipper, they do not generally guarantee the time of the arrival of the vessel at her port of destination.

* * *

IN THE case of CLEONA, 37 F. (2d) 599, the court observed: "It must be remembered that, fortunately, admiralty practice is plastic. It is largely judge-made, and consequently not technical—in fact, it is less technical than equity practice. Broadening from precedent to precedent, and based on a wisely administered convenience, admiralty practice has always been prepared to cope with new situations as they have arisen."

Build Giant Gate Lifter for New Welland Canal

ONE of the most interesting and important pieces of equipment in connection with the new Welland ship canal is the mamonth lock gate lifter of 500 tons capacity, capable of lifting the largest gate leaf used in the new canal. This lifter, which is shown in the accompanying illustration, is now nearing completion at the plant of the Collingwood Shipyards, Ltd. at Collingwood, Ont. for the department of railways and canals, Canada. The design of the lifter was worked out by the engineers of the Welland ship canal in conjunction with the Wellman Engineering Co., Cleveland. The American Ship Building Co. was employed in the design of the pontoon. After completion, this huge piece of lifting equipment must be towed through Georgian Bay, Lake Huron, Lake St. Clair and Lake Erie to Port Colborne, Ont., then through the new Welland canal to Port Weller where it will be located on the Lake Ontario side of Lock No. 1, making a total voyage of more than 600 miles.

This floating crane is a self contained unit entirely independent of other pieces of apparatus except that it is not self propelling. It consists of a steel pontoon, 90 feet long, 66 feet wide and 26 feet deep. The hull of the pontoon is provided with both permanent and movable ballast which is in the form of water in ballast tanks, three forward, two aft and two athwartships. The hoisting and control mechanism is electrically equipped throughout. The main engine is a 300-horsepower, forced lubrication, totally enclosed engine, direct connected to a 200-kilowatt, 230-volt, direct current generator turning 400 revolutions per minute. The main engine derives its power from an oil burning Scotch marine boiler, 10 feet diameter, 11 feet 6 inches long, and 160 pounds working pressure. This generator supplies power for the various motors, capstans, ventilating fans, heaters, lights, etc.

The towers, which stand 72 feet above the deck of the pontoon, consist of two trussed A frame bents, placed parallel to and at either side of the longitudinal center line of the pontoon, with their vertical front legs which constitute the two main columns, placed at the forward end of the pontoon. The rear legs of the A frames are inclined to form back stays. Upper and lower sheaves are carried by massive girders between the main columns. A stabilizing girder is used to maintain the transverse stability when handling a gate. This is a horizontal girder having guide wheels which engage the main columns so that the girder is free to move vertically but not horizontally with reference to the tower. The lifting ropes pass through this girder and the girder is lifted on projections of the hangar forgings which enter sockets in the girder.

Four separate main gate hoists are provided, spaced to suit the lifting eyes on each gate leaf. Each tackle is provided with a hanger forging, carrying an equalizer to which two rope sockets are attached. These sockets are at the two ends of a single 2¾-inch diameter rope which passes over two sheaves 9 feet 6 inches in diameter in the super-structure, thence around deflecting sheaves at the bottom of the main columns and around two similar sheaves in a hoist carriage and anchored around a sheave at the forward end of the carriage runway. This anchor sheave is in a bight of the rope and is carried on the plunger of a cylinder which which is connected to a fluid equalizing system.

Each hoist consists of a 50-horsepower Canadian Westinghouse direct current motor connected by reduction gearing to a screw 9½ inches diameter, and 53 feet 10¼ inches long. The nut of this screw is attached to the sheave carriage which is drawn from the forward to the after part of the pontoon by the rotation of the screw. Each hoist has a capacity of 125 tons. The hoisting tackles are so designed that a movement of 45 feet on the sheaf carriage raises the gate 90 feet. In lifting one of the heavy gate leaves, the operation is as follows:

When the main hoist blocks are attached to the gate at four different points, and when the first strain is taken on the hoisting gear, the forward ballast tanks are full and the after ballast tanks, empty. After each of the four motors is taking its share of the total load, the four hoisting units are locked together as a single hoist

Huge gate lifter with capacity of 500 tons for service on New Welland ship canal

and the pressures in the four hoisting cylinders become equalized through a system of valves. When the load is thus accurately proportioned, the valves are closed with the assurance that all the lifting cables are carrying their proportions of the load. As the hoisting takes place and the load increases, owing to the gate leaf being less water borne, the water is gradually pumped from the forward ballast tanks to the after ballast tanks and at the same time the sheave carriage moves from the forward to the after part of the pontoon, thus maintaining the pontoon at an even keel as the hoisting continues. At the same time, if necessary water is pumped from the port or starboard ballast tanks in order to keep the vessel on an even keel athwartships.

The fore and aft trim of the vessel is controlled by three ballast tanks forward and three ballast tanks aft and the water is transferred from forward to aft or vice versa by three 710-gallon-per-minute centrifugal vertical ballast pumps direct connected to electric motors. The athwartship trim of the vessel is controlled by one ballast tank on starboard side and one on the port side, the water being transferred from one to the other by a 250-gallon-per-minute vertical ballast pump direct connected to electric motor. All ballast manifolds are motor controlled.

The electrical control for the pump motors, hoisting motors, water level indicators, etc. is very elaborate and is designed to secure a maximum amount of safety and ease of control in handling the heavy weights. Operation of the main hoist equipment provides protection, not only against mistakes of the operator, but also against possible equipment failure, by means of an elaborate interlocking scheme. Reversing master controllers are provided which, through contactor panels, operate each motor independently. After the motors are clutched together, these controllers are rendered inoperative and a fifth, or grand master controller, operates all motors simultaneously. Slow down and stop limit switches are provided at the limits of travel. It is not possible to raise the load past the lower position of the equalizing girder by means of individual control. Should the pressure in any equalizing cylinder exceed the pre-determined setting, for hoisting, the hoisting cannot go on until this is rectified. The hoist control for the 50 horsepower motors is of the standard reversing hoist type, providing one step of armature shunting control for creeping speed and five sets of resistance control in both directions of rotation. The motors used are high torque, compound wound and provide powerful dynamic braking in addition to the magnetic brakes in the off position of the controller. A control room, built on the top of the deck house and amidships, contains remote controls for hoisting machinery, ballast pumps and ballast line manifolds, valves for controlling fluid equalizing system, gauges for indicating pressure in cylinders and telegauges for showing the amount of water in the various ballast tanks. The man in charge of the gate lifter will direct operations from the bridge on top of the towers from which point there is to be telephone communication with the control room and engine room. On the forward, sloping roof of the control room, there is a clear glass skylight which affords a view of the operating bridge.

In addition to the main hoist, there is a 25-ton auxiliary hoist, or derrick, which has a swinging boom, 90 feet long, mounted on a turntable at the forward end, controlled by a direct current derrick control. This auxiliary hoist is driven by a 30-horsepower series motor and a regular armature resistance hoist controller with dynamic braking for lowering, providing six points of control in each direction. The boom rotating motion is driven by means of a 12-horsepower series motor, with plain reverse control and dynamic braking on the off position. To prevent over balancing of the pontoon, a combination of interlocks is provided on the auxiliary hoist to stop the swinging of the boom past certain angles at various heights. This auxiliary derrick is to be used for handling the discharge valves of the various locks.

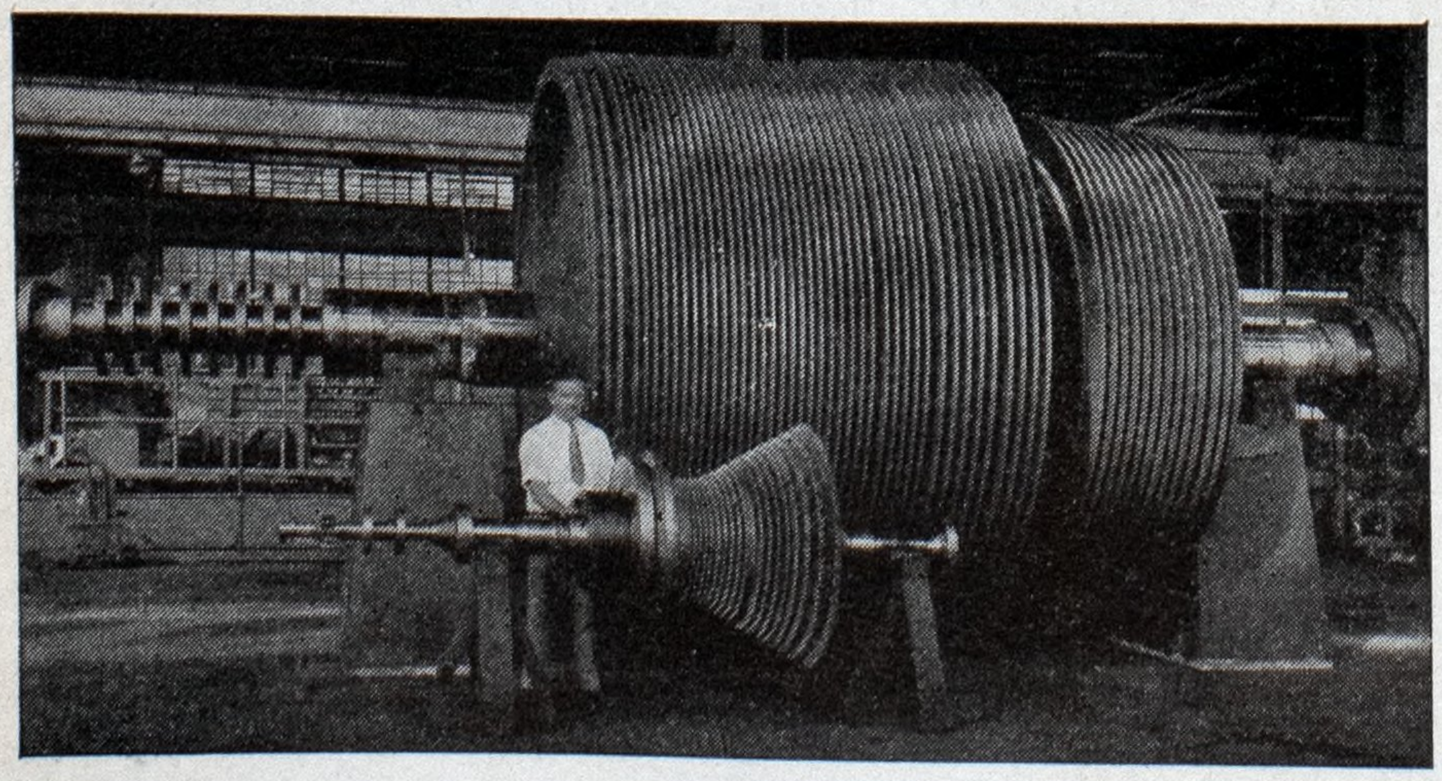
The deck of the pontoon is provided with five deck capstans driven by electric motors, each having high and low speed gearing, and placed two on each side of the pontoon and one at the after end for mooring purposes. A shore circuit is provided for lighting, heating and for running the auxiliary bilge pump, and will always be connected when the gate lifter is tied up at its dock. For night use, a battery of four Westinghouse 24-inch chromilite flood lights is mounted on the control tower located above the upper sheave support of the main hoist.

The lock gates which this lifter is to handle are of steel construction, horizontally plated with sheaving plates on both sides, so that when the necessary openings in the sheaving plates are closed with the removable covers, the gate leaves will float flat upon the water in which position they will be transported from the storage in the gate yard to the lock where a gate has been damaged and requires replacing. Upon arrival at the lock, the gate lifting pontoon crane, after first removing the damaged gate leaf, will lift the new leaf from its horizontal floating position into a vertical position and place it upon its pintle. The spare lock gates, of which there are to be eight, are stored in a gate yard. This is virtually a dry dock 500 feet long, being built especially to accommodate the gate lifter and the spare gates. Following arrival at the gate yard, the gate lifter is to be subjected to tests which will include lifting one each of the various gates.

The S. S. Lorain of the United States shipping board has been allocated by them to the Cosmopolitan Shipping Co. of 42 Broadway, New York City. This vessel will be operated by their subsidiary company, the American-France line, in the North Atlantic trade. She will ply between New York and French ports.

The Lorain was to start her initial voyage Oct. 8, equipped with the Todd unit system of pulverized fuel.

Pigmy and Giant Steam Turbines Each Deliver Same Horsepower



The photograph shows propelling turbine spindles for United States warships. The larger, a low pressure direct connected rotor of the battleship Pennsylvania, is being rebalanced at the South Philadelphia works of the Westinghouse Electric & Mfg. Co. The smaller, a high pressure spindle, which drives a ship's propeller through reduction gearing, has just been constructed at the same works. Each delivers approximately 7000 horsepower, the larger at about 240 revolutions per minute and the smaller at 3600 revolutions per minute.

Modern Electric Galley on Liner Morro Castle

By R. H. MacGillivray

REAL progress has for its ultimate purpose, the bettering of living or working conditions, the reduction or elimination of labor, and the production of a better article. If in addition an economic advantage can be shown, acceptance is inevitable.

The rapid strides made by the diesel engine and turbine-electric machinery for ship propulsion is largely responsible for the ever increasing use of electricity for the many auxiliary purposes on board ship. It is cheaper to use oil in the engine room for the generation of electricity than to transport it to the ship's galley where space is valuable. Other factors also make such a procedure preferable.

Use of electricity for cooking and baking purposes has received general acceptance in commercial establishments throughout the world. The one, and possibly the only objection to its more general use, has been the question of operating costs in certain localities. Such an objection does not apply on shipboard where the fuel cost per kilowatt hour for electric auxiliary power will average approximately $.004 in ships of the passenger type equipped with large auxiliary turbine generators. This low cost combined with other savings as compared with fuel types of cooking equipment, clearly indicate the economical operation of electrified galley equipment.

The author, R. H. MacGillivray, is with the Westinghouse Electric & Mfg. Co. in its commercial cooking section. This article was especially prepared at the request of the editor.

The peculiar advantages of the electrified galley over the coal or oil fired marine equipment can be summarized as follows:

1. That dread menace of the sea, fire, is practically eliminated with the electrified galley. Electric cooking equipment is as safe in heavy weather as in fair weather.

2. Electric galley equipment conserves space—less equipment is required, and no extra fuel space is necessary or fuel oil lines.

3. Less waste heat from electrical equipment insures cooler working conditions in the galley and bake shop, resulting in higher efficiency and a satisfied galley force.

4. Electric galley equipment is clean and stays clean. There is no soot, dirt, ashes or the necessity for fuel handling. The galley can be turned over to the travelling public for inspection.

5. Sturdy construction of electrical equipment insures long life and low maintenance. There are no steam or oil lines to be kept tight. Heat and cold have no effect on electrical circuits.

6. Positive control of temperature and uniform distribution of heat insure continuous satisfactory operation day after day, with a consequent higher quality of food. Reduced shrinkage of meat in the roasting operation is not an inconsiderable item in the matter of food.

Main Galley on the new Ward Liner Mono Castle—Electric Ranges

One of the many steamship lines to appreciate the advantages of electricity for the ship galley is the Ward line. The two new New York to Havana liners, are completely equipped with electrical appliances for all cooking and baking requirements. These ships, the MORRO CASTLE and the ORIENTE, launched in 1930 are twin screw, turbine electric drive, with a designed speed of 20 knots. The Morro Castle was fully described in the September issue of MARINE REVIEW. Designed by Theodore E. Ferris, naval architect, built in the yards of the Newport News Ship Building & Dry Dock Co., these de luxe modern vessels are engaged in the New York-Havana run of the Ward line.

Equipment installed on each vessel for the galley and bake shop, includes the following electrically heated appliances:

In the main galley there are eight 4-foot sections of Westinghouse marine type ranges in two banks, one of five ranges and one of three ranges. Each range is equipped with four cast iron cooking plates measuring 12 x 18 inches.

The top cooking plates are large enough to allow four cooking operations at one time for each range. The even heat distribution of the plate prevents so called "hot spots" and the high plate temperature allows rapid operation. The two front plates have excess heating capacity for quick frying, etc. Plates will not buckle or warp in service.

The roasting oven mounted in base of range is large enough to accommodate a good sized roast, being 22 inches wide by 28 inches deep by 16 inches high, having top and bottom heaters and equipped with adjustable racks.

All electrical circuits are separately controlled by three heat switches and are all independently fused. Each bank or battery is supplied with the necessary sea rails and grab rails for high sea service. In addition to the ranges, the main galley is equipped with a large electric boiler of the marine type complete with same size roasting oven as the ranges, and also an insulated warming oven directly above the broiler grid. The broiler grid is divided in three separate sections each having individual three heat control and separately fused.

The bake shop is equipped with one 3-section Westinghouse bake oven, each section having a capacity of 40 one-pound loaves of bread or four standard bun pans. Each section is a separate operating unit, fully insulated so that if necessary three distinct products can be baked at one time in the adjacent sections. The particular features of this oven are the even distribution of heat and the automatic control of temperature, which latter can be maintained

(Continued on Page 96)

What Diesel Electric Drive Will Do

Has Many Applications—Allows Use of Light High Speed Engine—Will Carry Port Load—Flexible in Maneuvering—Easy Control and Economy

By Frank V. Smith

DIESEL electric drive, which had its first taste of salt water in 1919 when the fishing trawler MARINER was launched, has found a large field of useful service since that date. It is still broadening its field of application and each year finds some new type of ship favorable to its further growth. Its future is firmly linked with the question of higher engine speeds which automatically reduce the weight, the space requirements and first cost.

Versatile Type of Power Plant

As a versatile type of power plant diesel electric has no competitor. Two generators attached in tandem to a small high speed diesel engine are all sufficient; one generator to propel the ship, and the other to drive the auxiliaries, furnish lights, and cook the meals. Such units are renowned for their team work; if one equipment isn't powerful enough for the job, two, three or four can be used, in which case they will equally divide the load. Another good feature of diesel electric drive is that it isn't fussy about resting while in port. Not being permanently tied to the propeller shaft it will tackle a job of unloading freight or of pumping cargo oil without coaxing. Diversification is its spice of life.

The author, Frank V. Smith, is a member of the staff of the Federal and Marine Department, of the General Electric Co. This article was prepared at the request of the editor.

Diesel electric drive is both independent and tractable. It will give its full measure of power on heavy slow loads as readily as on light swift ones. It is both a draft animal and a race horse. It requires little harness and can be controlled with the little finger better than most drives can be with a myriad of levers and air bottles. It will respond to the captain's orders on the bridge just as readily as it will to the engineer's. It has no secrets and its meters are an open book of its actions and moods. It is saving of room on a ship and is satisfied with the care of its shipmates. It hasn't the bad habit of smoking and it likes good fuel—but little of it.

Of Proven Merit for Towboats

With so many virtues one would never suspect that diesel electric drive ever had any growing pains during its early youth. Its first suggested use on a tugboat was met with the statement—"Diesel electric drive is all right but not for tugboats." After its first trial on a tug opinions were quickly changed. It pulled more on the towline per engine horsepower because it could swing the proper kind of propeller and could deliver maximum power while towing. It could even deliver full power with the boat tied to a standstill. This was a handy kind of power to have when accelerating a tow or warping a ship into dock. The power could be gradually applied and this in turn saved the snapping of towlines.

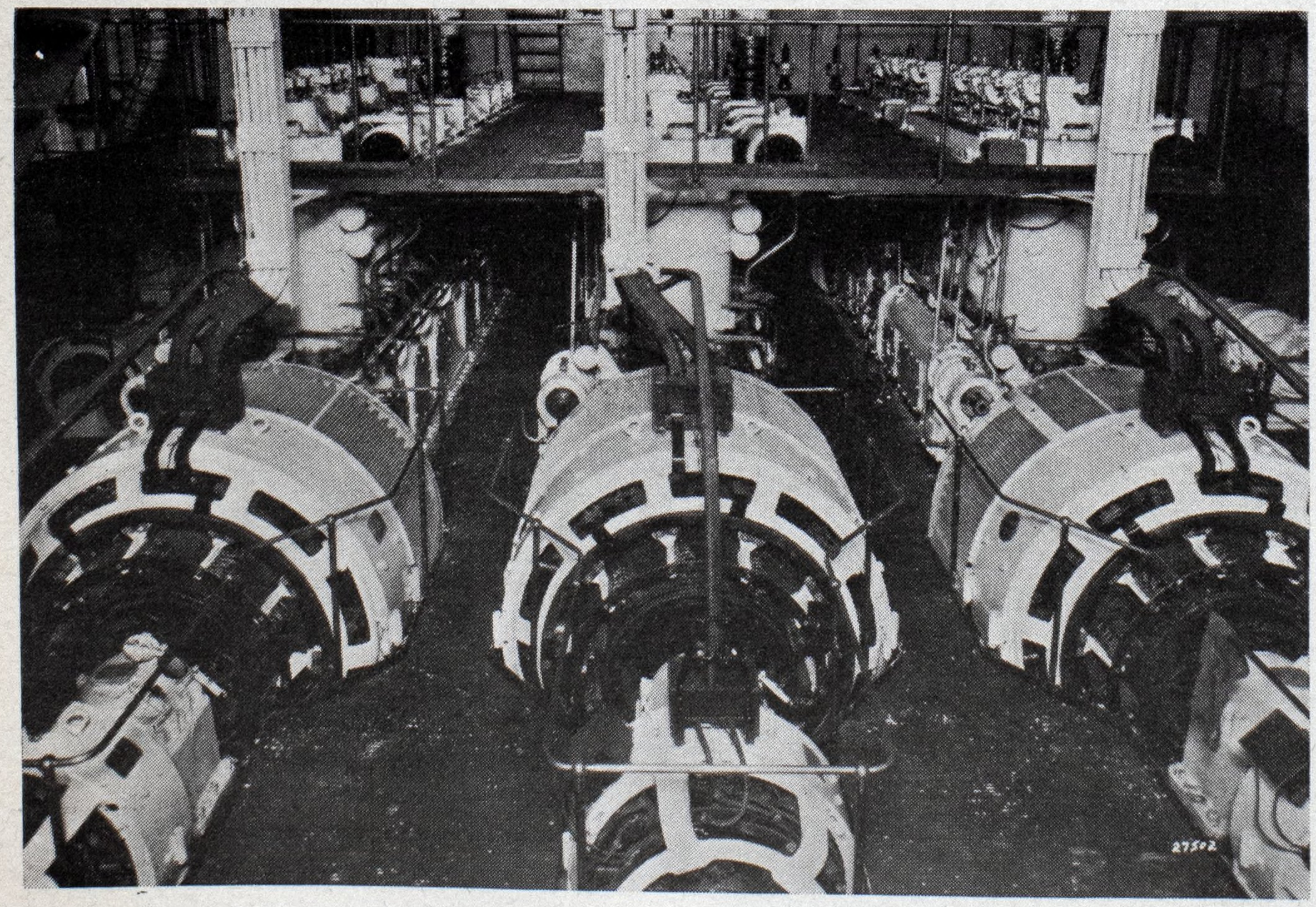
When diesel electric drive was applied to a double ended ferry boat the squatty engines allowed the whole main deck to be free for vehicular traffic. The forward propeller could be run at negative slip and all of the power will be delivered to the after screw. The gain in propulsive efficiency by applying the power where it would do the most good more than offset the electrical losses.

Diesel electric was then found to be a fine type of drive for oil tankers. The main power plant could be used for pumping oil. This did away with the necessity for carrying around a large auxiliary plant at sea that could only be used in port, and having aboard a large plant in port that could only be used at sea. It was also found that because of the smallness of the engines, the ordinary repairs and upkeep could be accomplished by the crew. And then, too, an engine could be cut off the line and repairs made at sea.

Standby Losses Almost Nil

As people got acquainted with diesel electric drive many other good points began to appear. The port standby consumption of fuel became almost nil and power for starting on a voyage was available at a moment's notice. The engines with their small diameter cylinders did not need internally cooled pistons. The engines ran in one direction only and reversing mechanisms were unnecessary. Simplifying the engine down to its basic elements resulted in very economical operation. Engines could be duplicated and built in quantities which fitted in with the American form of mass production. Two or three different sizes of engines could be made to fit almost any job simply by increasing or decreasing the number of units installed. In one way it was the nearest approach to the methods of automobile engine manufacture ever attempted in the marine industry.

When the all sufficiency of diesel electric drive became fully understood other horizons appeared. The self propelled dredge became a fertile field because the power could be used for propulsion enroute to the base of operations, and to drive the pumps or to operate the clamshell buckets when



Diesel Electric Tanker Point Breeze—Three 600 H.P. Ingersoll-Rand Diesel Engines And General Electric Main And Auxiliary Generators

at the base. It became adapted to a coast guard cutter doing Arctic duty because of the small quantity of fuel required and added reliability. Lightships could depend upon it for auxiliary power needs or for quick power in case there was danger of dragging their anchor chains in a storm, and they could stay for longer periods at their bases without refueling. Canal boats benefited by it because of the lesser weight of the fuel and the excellent maneuvering qualities when entering locks. Diesel electric drive makes a fine auxiliary power plant on a sailing yacht, and has many sound reasons for its application to river tow boats, small cargo boats and ships of special type.

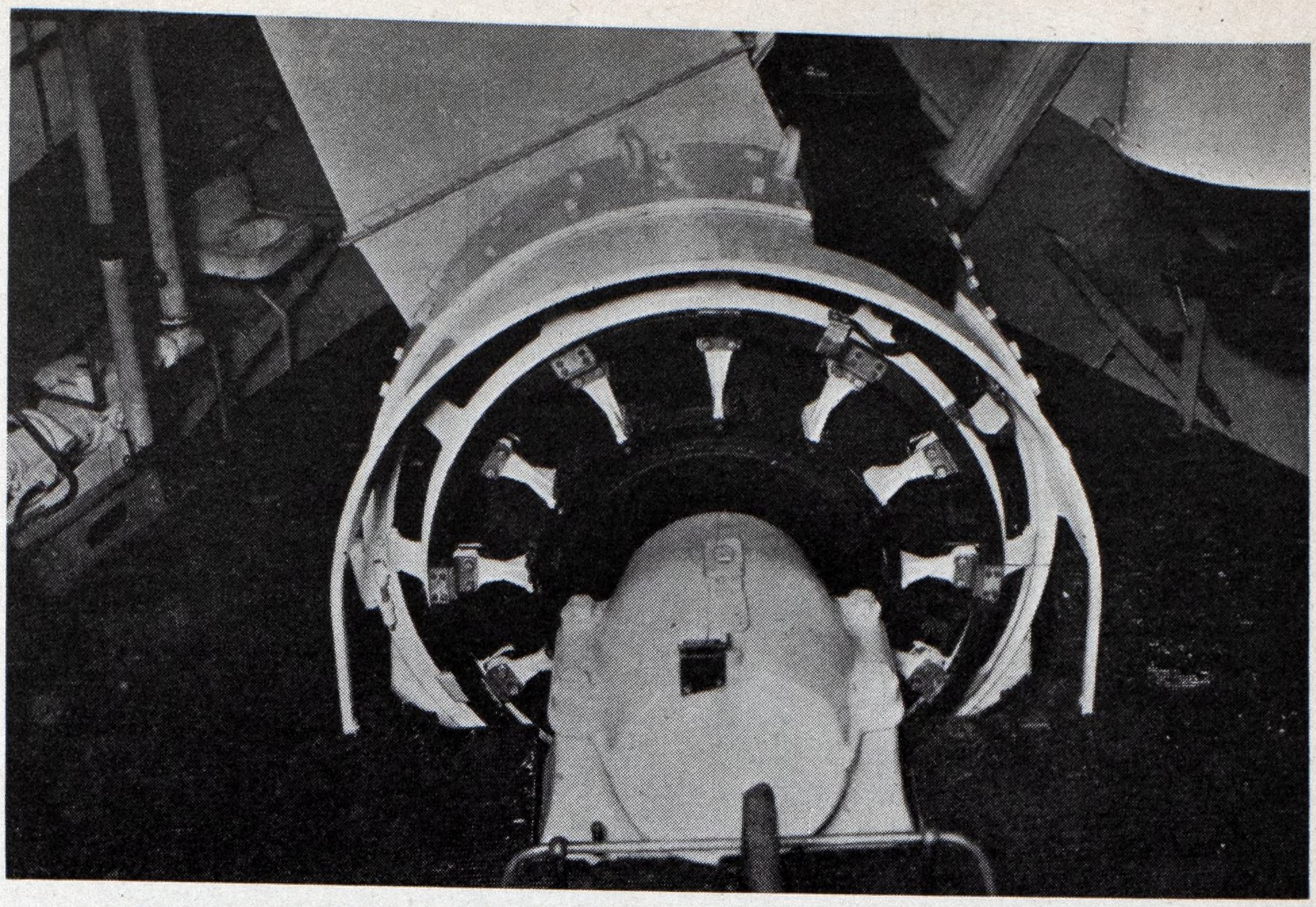
No one even suspects that diesel electric drive has reached its limitations. Small diesel engines are speeding up and the weight per horsepower is being reduced. The higher the speed at which they go, the less likely they are to be connected directly to the propeller shaft. The propellers for boats which have work to do are normally slow speed drivers. Each advance in engine speed, therefore, opens up a larger field for electrical speed reduction.

There is also an altruistic side of diesel electric drive. A visit to our principal seaports discloses in the background towering structures of a newer civilization, while the foreground is littered with coal chutes, ash barges and smoking craft. It has a big job ahead of it to bring the two into closer harmony.

There has been a good deal of romance connected with the development of diesel electric drive over a period of ten years. In the beginning it was a sort of football in the application engineering departments. Except for the clear vision and tenacity of a few men it would have died a natural death like many other good ideas. In the beginning it was an idea that had to be sold, not one that sold itself. There was too much mystery about it for the ordinary layman and most marine men looked upon electricity as the very devil himself. Today the idea sells itself and is self-energizing. During the year 1930 the General Electric Co. and its associate company, the British Thomson Houston Co. outfitted 22 boats.

Steadily Improved in Application

The fundamental engineering has remained the same but the equipments have taken on a more professional appearance—the result of ten years of continuous refinement. Unnecessary doo-dads have been taken off and necessary ones added. Controlling equipments have become standardized and are assembled in sections according to the number of generating units installed. Some think that further modifications will be made. There was an installation in which an ammeter was placed on the bridge so that the captain could tell how much power was being delivered to the propellers; the story is told that the captain called up the engineer before starting a voyage, saying—"Chief, I have plenty of volts on the bridge but no amps." The electrical enginneers are now working on some new graduations for the scales of their meters.



Propulsion Motor on Tanker Point Breeze—1800 H.P. at 90 R.P.M.

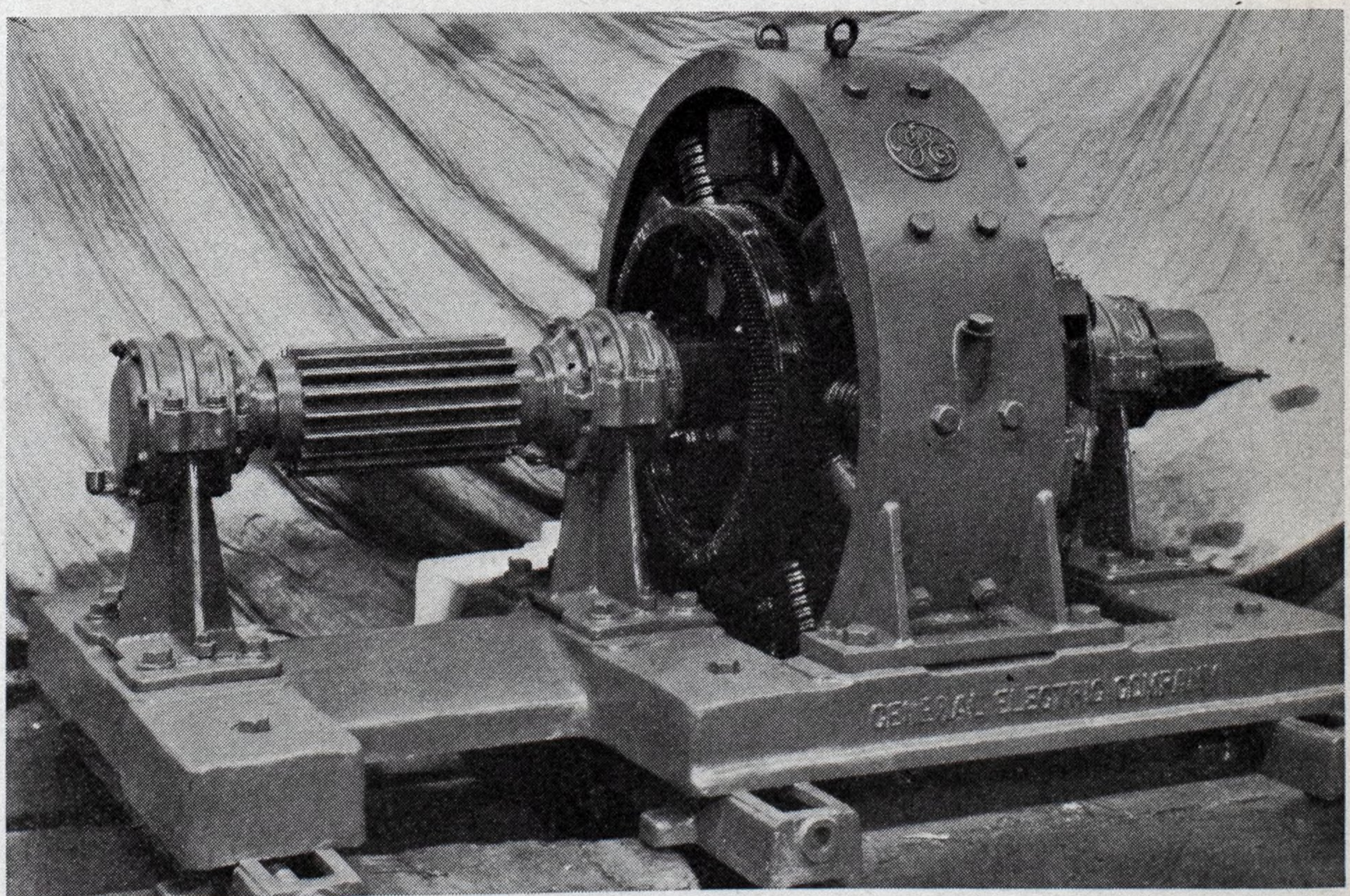
Diesel Electric Drive Quite Simple

From an application and operating standpoint diesel electric drive is quite simple. The engines with their generators can be placed anywhere in the ship. The motors, however, must be attached to the tail shaft. Outside of this there are no restrictions. Why and how the equipment works is shown in the diagram accompanying this article. As can be seen the generator field circuit is the heart of the system. A voltage change changes the propeller revolutions and a polarity change alters the direction of rotation; this is all accomplished by the movement of a single lever on the bridge or by the turning of a wheel on the engine room operating panel. The current which varies with the load is adjusted by the motor field rheostat.

Power Variation Easily Controlled

When two or more diesel engine driven generators are placed on the propelling circuit they are electrically connected in series. Their voltages add, which means that the propeller revolutions likewise will increase. As the propeller absorbs power in accordance to the cube law it means that the current-voltage ratio must be altered when driving the ship with a fraction of the number of units installed, to load the units in use fully. This is accomplished by weakening the motor field, which in turn allows more main line current to flow at the lesser voltage.

Questions are often asked regarding



Propulsion Motor With Chain Pinion for Turning Stern Wheel River Boat—150 H.P.

the status of the engineers aboard a diesel electric driven craft. Up to the present time, ex-steam engineers have been filling the jobs and no reason is seen for a change.

An insight into this year's business in diesel electric drive is illuminating because it shows to what extent it is becoming established in a highly diversified field. As to ship types, the 22 installations were divided as follows:—Tankers, 6; tugboats—propeller type, 7; river tow boats, stern wheel type, 2; lightships, 3; survey boat, 1; light house tender, 1; auxiliary power plants on sailing yachts, 2.

The tankers built in this country were named the VEEDOL No. 2, L. T. C. No. 1, L. T. C. No. 2 and L. T. C. No. 3. The VEEDOL is a 1000 shaft horsepower craft and the L. T. C. boats, 500 shaft horsepower each. Two tankers were built abroad, each rated 2800 shaft horsepower, for which an associate company of the General Electric built the equipment.

Of the seven propeller type tug boats, four of 800 horsepower each were built for the Erie railroad; two of 515 horsepower each for the Mystic Steamship Co.; and one of 800 horsepower for the Canadian Pacific railroad. The latter, which is to be used for shunting car floats, is unique because it can be controlled from the car float just as well as it can from the pilot house or engine room of the tug itself. The tugs for the Erie railroad were named the CLEVELAND, ROCHESTER, SCRANTON, and OLEAN; those for the Mystic Steamship Co., VENUS and LUNA; and the Canadian Pacific tug PRESCOTONT.

The lightships numbered 115, 116 and 117 were named respectively the FRYINGPAN, FENWICK ISLAND and NANTUCKET. They are similar to the three commissioned last year of which the FIRE ISLAND gained quite a reputation by making the 6000-mile cruise between the West coast to her station on the East coast under her own power. The survey boat was named the LISTON. All of the foregoing boats were rated 350 horsepower each. The lighthouse tender, which was named the LINDEN, is a 240-horsepower craft. The government owned stern wheel river tow boats were named the SCOTT and FORT ARMSTRONG, and they were each of 150 horsepower rating.

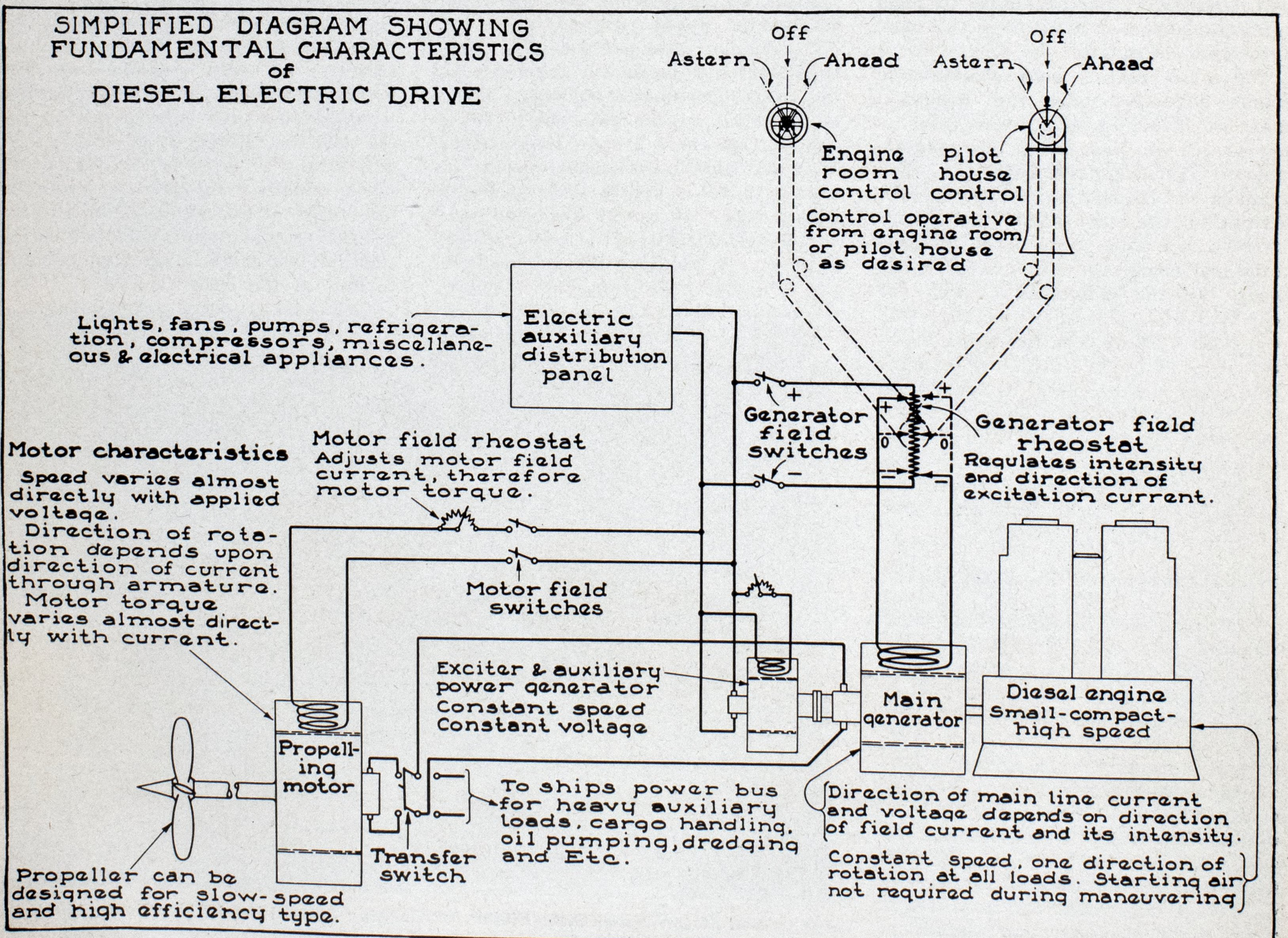
Ten years ago the innovation of a new type of drive on 22 boats would have caused quite a commotion in marine circles. Today the unusual is taken for granted.

A glance around our habors, our inland waterways and our lakes shows a lot of equipment suffering with age, which as years roll by must be replaced by modern equipment. That diesel electric drive will play a large part in this rejuvenation process there can be no doubt.

Middle West Foreign Trade Conference in Session

A record attendance is expected at the Middle West Foreign Trade and Merchant Marine Conference scheduled for Oct. 27 and 28 at Indianapolis. Among the papers to be read are the following: *American Ships as an Aid to Distribution in Foreign Markets*, by H. G. Smith, president National Council of American Shipbuilders; *The New American Merchant Marine* by T. V. O'Connor, chairman United States shipping board; *The Modern Trend in Merchant Ships-Fast Ocean Freight Service At Minimum Cost* by Edward B. Pollister, president and general manager, Busch-Sulzer Bros. Diesel Engine Co. Other speakers include Bennett Chapple, vice-president American Rolling Mill Co.; Leighton Rogers, chief, aeronautics division, bureau of foreign and domestic commerce, and C. J. Junkin, chief, division of commercial laws, bureau of foreign and domestic commerce.

Cornelius Van de Stadt, general passenger agent of the Holland America line and well known in shipping circles, celebrated the fortieth anniversary of his service with the line on Oct. 2. He joined the line when he was 15 years of age.



Big Dredge and Self-Unloader Ready

Largest Sand Sucker—Also Self Unloader—Turbine Electric Drive—First Pulverized Coal Burner on Lakes—Hopper Capacity 10,000 Cubic Yards

NEARLY six years ago, on Dec. 17, 1924, one of the great war fleet of lake-built ocean freighters arrived in Cleveland, carrying as her only freight two new diesel engines and other machinery which were to be used in her elaborate conversion to a diesel electric seagoing hopper dredge. On May 6, 1926, this dredge, named the SANDMASTER, sailed for Chicago where she immediately began to work. She was without doubt the most modern vessel of her kind at that time. But she will now soon be eclipsed in practically every engineering feature and very greatly in size by the combined hopper dredge and self-unloader, J. R. SENSIBAR, nearing completion at the Lorain, O., plant of the American Ship Building Co. for the same owner, the Construction Materials Co. This vessel, shown in the accompanying illustration at the shipyard dock with steam up and nearly ready, was formerly the bulk freighter FRANK C. BALL. Work of converting this ordinary freighter into the present extraordinary turbine electric pulverized coal burning, hopper dredge and self-unloader began Jan. 1 of this year. Delivery is anticipated about Nov. 1. The total cost of the original vessel and conversion is said to be around $1,800,000.

The J. R. SENSIBAR is by far the largest hopper dredge on the Great Lakes and likely in the world. Her length between perpendiculars is 530 feet; the molded beam is 56 feet, and the molded depth is 31 feet. The hoppers have a capacity of 274,600 cubic feet or 10,000 cubic yards. The vessel's carrying capacity is 10,000 tons (2000 pounds to the ton) on 20 feet 9 inches draft. Tank suctions are eight inches in diameter to each compartment. The double bottom is divided into eight compartments and the side tanks are divided into eight compartments.

It is difficult to conceive of any ship in which more courage has been shown in making a practical application of the advances made in many features of marine engineering. For instance, the propulsive machinery is turbine electric of the type built by the General Electric Co. for the shipping board and installed in the ECLIPSE and INDEPENDENCE class of vessels. The main motor operating on alternating current is rated at 3000 shaft horsepower at 106 revolutions per minute. To go with the new machinery there is a new tailshaft and stern tube with a Cutless rubber stern bearing, incidentally one of the largest bearings of this type (14½-inch diameter shaft) in service. The propeller is new and had the benefit of design by the noted propeller authority, the late Rear Admiral C. W. Dyson. The main thrust and also the thrusts for the large centrifugal pumps are of the modern Kingsbury type.

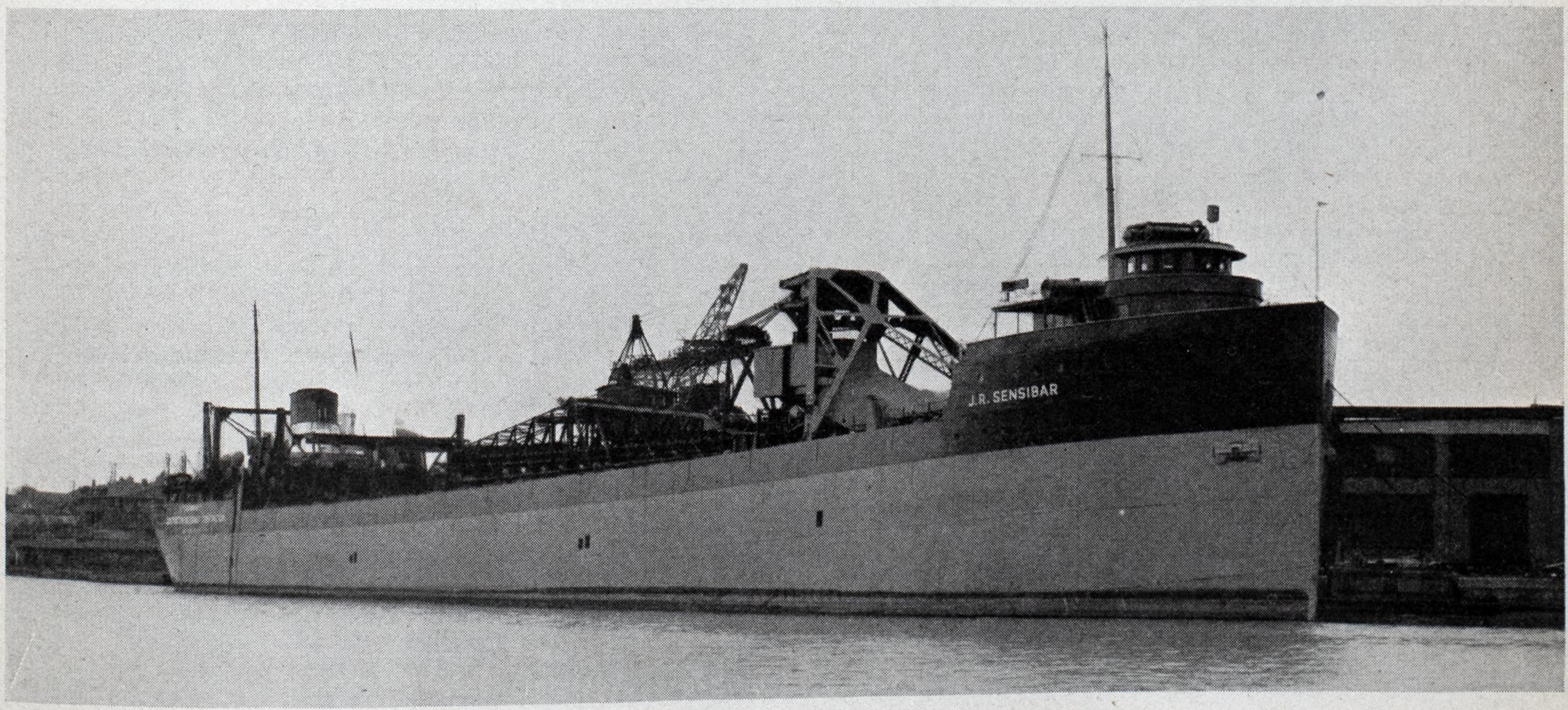
The sand pumping equipment includes two 28-inch centrifugal dredge pumps, motor driven and specially designed. These pumps are connected to 30-inch suction piping and 28-inch discharge piping connected to overhead flumes which discharge into the hoppers. Hoppers are discharged by pumps sucking from the hoppers and discharging overboard. Wells controlled by gates handled from the deck are fitted in each of the hoppers. By this means the cargo is controlled both for loading and unloading.

The conveying equipment consists of two 48-inch hold belt conveyors, motor driven, with power operated gates feeding from the bottom of the hoppers to the belts and discharging to two cross conveyor belts at the forward end of the vessel. These in turn discharge to a 60-inch inclined conveyor belt, which carries the cargo to the deck, where it is discharged to a 60-inch conveyor belt mounted on a 170-foot boom which is swung over the side, allowing the cargo to be discharged to the dock.

This ship is equipped with the J. R. Sensibar method of loading and unloading cargo; methods and units patented and patents pending. As far as known this is the fastest bulk unloading plant either afloat or ashore. It is anticipated that the maximum rate of unloading will be in excess of 4500 tons of bulk cargo per hour.

Among the new equipment installed on this vessel are: Oertz streamline rudder; propulsion control in the pilot-house; Benson electric draft gages; navy type binnacle; refrigerating plant and icebox; new sanitary system; new heating system; new fresh water tanks and piping; and complete new lifesaving gear, including lifeboats and equipment.

The equipment includes a single-pass surface condenser of 4300 square



J. R. Sensibar—New Sand Sucker and Self Unloader—Turbine Electric Machinery—Burning Pulverized Coal in Scotch Boilers as this photo Was Taken at the Dock of the American Ship Building Co., Lorain, O., Oct. 21, 1930

feet cooling surface; air ejectors; a 16-inch centrifugal circulating pump; a 3-inch centrifugal condensate pump; a 7½ x 7 x 10 inches horizontal duplex auxiliary condensate pump; a 14 x 8 x 12-inch horizontal simplex boiler feed pump; an auxiliary condenser of 700 square feet; and a combined air and circulating pump. All of the foregoing equipment is new and was furnished by Worthington Pump & Machinery Corp. Additional new equipment includes a Reilly two-pass feed water heater; a Griscom-Russell grease extractor. A new feed and filter tank has also been installed and is connected to all the exhaust lines.

For auxiliary power when in port there is a new Westinghouse turbine generator set of 750-kilowatt capacity. This set takes its steam from the main boilers.

One of the outstanding features of this interesting vessel is its steam plant. There are three Scotch boilers, two of them are 15 feet 9 inches in diameter and 11 feet in length; the third is 14 feet 6 inches in diameter and 11 feet in length. Working pressure on all boilers is 190 pounds per square inch. The boilers are fitted with Ellis and Eaves induced draft and Foster superheaters.

Raising sufficient steam was one of the problems facing the designers. It was necessary to choose some efficient system of firing. Coal is the natural fuel for vessels on the Great Lakes. After much study it was decided to install the Todd unit system of pulverized coal. This vessel is therefore unique in being the first vessel, as far as general knowledge goes, on the Great Lakes to burn pulverized coal. There are three triplex Todd mills, one serving each boiler. There are three units in each mill, so that any one furnace can be operated independently. From the mills flexible metallic hose to each furnace front delivers the fine coal to the burners. The mills take coal from a bin, which in turn is filled by taking run of mine coal, elevating it and passing it through a crusher where it is crushed to perhaps approximately ¾-inch size. The coal is carried from the main bunker to this auxiliary bunker or bin from which the pulverizers are fed by a Link-Belt flight conveyor. Each individual pulverizer is driven by an electric motor. The speed of rotation of the pulverizer is stepped up by gearing from the motor. Auxiliary oil-burning equipment of the Todd oil burning system is fitted to each furnace for lighting off coal fires. Steam has already been successfully raised burning pulverized coal and it is anticipated that the practical success of this installation will result in its adoption on other lake vessels.

J. R. Sensibar, after whom this vessel has been named, is president of the Construction Materials Co. and he is generally responsible for the initiative shown. C. R. Fisher, formerly chief engineer of the Bradley Transportation Co. has acted as consulting engineer and he is directly responsible for the selection and installation of many striking electrical features. R. A. Brinkman, superintendent of the owning company, has been in general charge of the conversion. H. N. Herriman of Cleveland has acted as naval architect. A complete description of this vessel, her machinery and equipment, with illustrations will be published in the December issue of MARINE REVIEW.

General Manager Dies

Charles A. Mudge, general manager of the Electro Dynamic Co., Bayonne, N. J., died Oct. 11. After graduation from Cornell university in 1895 he joined the Westinghouse Electric & Mfg. Co. remaining there until 1900 when he became associated with the Sprague Electric Co., with whom he was employed until 1905. In the latter year he spent some time in Germany doing consulting work on railway motor design. In 1906 he became associated with the Electro Dynamic Co. and from 1908 to 1911 was with the General Electric Co. in the department of railway motors. After a period of six years, 1911 to 1917, with the United States Light & Heat Corp. at Niagara Falls, he returned to the Electro Dynamic Co. as general manager, the position he held until the time of his death.

Mr. Mudge's home was in Elizabeth, N. J. He was a member of the National Electrical Manufacturers association and American Institute of Electrical Engineers. Funeral services were held in Cleveland. Mr. Mudge was in his sixtieth year.

Naval Architects Meet in New York Nov. 13-14

THE thirty-eighth general meeting of the Society of Naval Architects and Marine Engineers will be held in the Engineering Societies building, 29 West Thirty-ninth St., New York City, Thursday and Friday, Nov. 13 and 14. Fourteen papers are scheduled for presentation at the professional sessions which will begin each day at 10 a.m. The council of the society will meet prior to the general meeting at 3 p.m., Wednesday Nov. 12 in the board room on the fifteenth floor of the Engineering Societies building through the courtesy of the American Society of Civil Engineers.

In accordance with past custom, the annual banquet will be held at 7:30 p.m. on Friday Nov. 14, and will take place in the grand ballroom of the Hotel Pennsylvania. Immediately preceding the banquet, a reception will be held beginning at 6:30 p.m. The titles of the papers, their authors, and the order in which they are to be delivered follow:

Thursday, Nov. 13, 1930

1. *The Construction of Diagrams for Formulas*, by Prof. Herbert L. Seward, member.
2. *Uses of Aluminum in Shipbuilding*, by Paul V. Faragher, visitor.
3. *Ship Design from the Operator's Point of View, with Particular Reference to Cargo Handling and Stowage*, by William B. Ferguson, member; Carl E. Peterson, life member and Harry E. Stocker, visitor.
4. *Load Line Regulations with Special Reference to the International Load Line Convention*—1930, by David Arnott, member.
5. *The S. S. Leviathan, Damage, Repairs and Strength Analysis*, by John L. Wilson, member.
6. *Natural Frequencies of Hull Vibration*, by Lieut. W. P. Roop (CC), U.S.N., visitor.
7. *Results of Experiments upon Bulbous Bows*, by Prof. Edward M. Bragg, member.
8. *The Interior Decoration of the Passenger Liner*, by Harry B. Etter, member.

Friday, Nov. 14, 1930

9. *Modern Geared Turbines*, by C. R. Waller, member.
10. *The Variable Pressure Water Tunnel of the U. S. Experimental Model Basin*, by Commander Harold E. Saunders (CC), U.S.N., member.
11. *The 10,000 Ton Treaty Cruisers, with Particular Reference to the Salt Lake City and Pensacola*, by Rear Admiral George H. Rock, (CC), U.S.N., vice president.
12. *Thrust Measurements on the S.S. Clairton*, by R. R. Adams, visitor.
13. *Tests of Model Propellers of Various Blade Sections*, by Rear Admiral David W. Taylor, (CC), U.S.N., retired, past president.
14. *Test Results of a Series of Fifteen Models*, by James L. Ackerman, member.

Controls for Shipboard Auxiliaries

Proper Control Equipment for Below Deck—Electrical Equipment Needed in Good Operation—Development Has been Rapid in Recent Years

By Wm. Hetherington Jr.

ADVENT of the diesel drive in tanker, cargo and passenger ship has brought about marked improvement in the use of electrical auxiliaries for below deck applications. Early in the development there were two schools of thought. Some engineers advocated alternating current supply, and others advocated direct current supply. The former contended that direct current was impractical for use, particularly on tankers, because of possible danger due to igniting gases, from moving parts. Subsequent developments disproved this theory as it was found quite practical to overcome this hazard. Alternating current while used on a number of the earlier vessels, did not provide the flexibility possible with direct current.

As flexibility in operation is most important for electrical auxiliaries, direct current has come into general use for auxiliary applications. Direct current has definite advantages in that speed control and torque characteristics are available, particularly for use with such auxiliaries as cargo pumps, adjustable speed circulating pumps, adjustable speed compressors, etc.

Three Forms of Control Available

For the operation of these classes of auxiliary machinery, three forms of control are available, viz., manual, automatic and drum types, and for the particular location are either of the enclosed, drip proof or waterproof construction. These controlling devices are generally designed for use with motors operating on 115-volts, or 230-volts, direct current.

In designing controllers for shipboard use, the particular condition under which they are to operate, must be carefully considered. They should be simple in design and construction, rugged, and require minimum maintenance. Control equipment should furthermore be designed in all its details for the particular duty to be performed. On account of salt atmosphere all controller parts liable to corrosion must be adequately protected by a non-corrodible finish on all parts. On board ship considerable vibration is experienced, and sometimes shock and, therefore, it is the best practice to use asbestos lumber panels, or equivalent, switch panels, for mounting the necessary switches, contactors, relays, etc.

Unless controllers are mounted on, or form part of a switchboard equipment, the prevailing practice is to enclose them in cases of either drip proof or waterproof design, depending upon where the controller is located in the vessel. It is not sufficient to furnish controllers in ordinary sheet iron boxes, but the enclosures should be an example of fine steel cabinet work. Enclosing cases should be so designed that they will not warp or weave out of shape and be sufficiently rugged to satisfactorily support all of the control elements within the enclosure. They should furthermore, be designed to provide adequate ventilation by means of louvres and at the same time in case of drip proof panels to exclude effectively solid or liquid material falling from any direction up to a maximum angle of 45 degrees from the vertical.

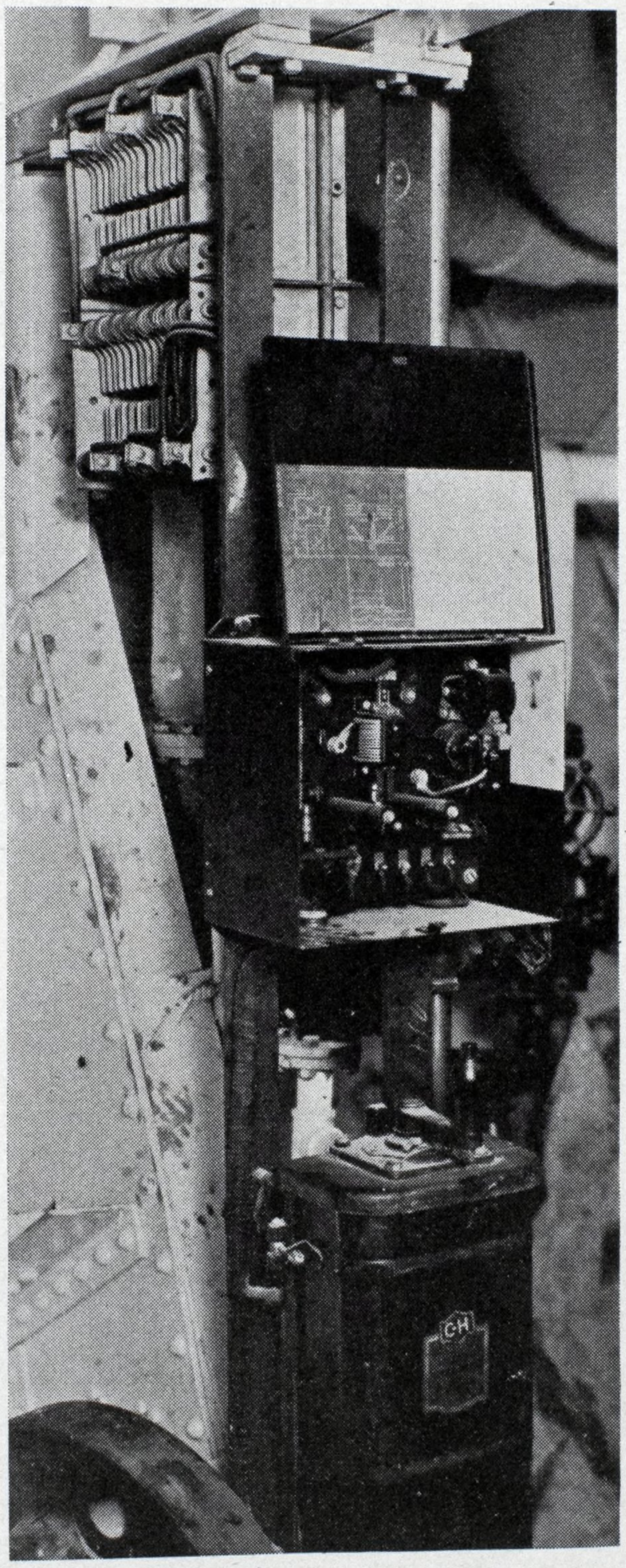


Fig. 1—Controls for 20 H.P. Motor for Engine Turning Gear on M. S. Tide Water and Tide Water Associated

While it is desirable to have minimum overall dimensions, sufficient room within the enclosure should be provided for making all connections to incoming and outgoing leads. The best practice is to use structural steel plating for the enclosures. As most under deck auxiliary controllers are mounted on bulkheads, the mounting feet should be so located and designed as to facilitate installation.

Withstand Shock and Vibration

The resistor element should be designed to withstand vibration and shock. Non-fragile resistors of the wire drawn type or unbreakable grids where used with controllers of higher horsepower ratings, insure long and satisfactory life. As all resistor elements are subjected to salt atmosphere the resistor units themselves should be suitably enclosed in the smaller ratings, and where grids are employed they should be protected to withstand corrosion by zinc plating or some other approved process. Resistors must also be carefully designed and proportioned for the given application so as to provide smooth acceleration of the motor without causing shock or sparking.

In all of the three types of controllers mentioned above the best practice is to provide a double pole line knife switch thus permitting cutting off all current to the panel parts and motor and preventing unauthorized manipulation, also facilitating inspection and renewal of parts. Another important feature of design of auxiliary controllers is the use of pilot fuses for pilot circuits where they leave the panel for operation from a remote point by means of a push button station, or some other master device. These fuses protect all external pilot wiring, so that in case of grounds or short circuiting no damage to the equipment will result.

Due to the roll and pitch of the ship, it is necessary that moving parts of controllers such as contactors, relays, and interlocks be so de-

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The author, Wm. Hetherington Jr., is manager of the Marine Department of Cutler-Hammer Inc.

signed as to prevent accidental closure. These parts should, therefore, be designed to withstand at least a 30 degree inclination test of the control panel from the normal operating position, and this is accomplished by means of tail weights or springs used on the contactors, relays, etc. These contactors and relays must furthermore be so designed as to work satisfactorily when operated at maximum working temperature, 20 per cent below, and 10 per cent above normal ship's voltage, and when subjected to destructive arcing they should be provided with effective renewable arc rupturing contacts and magnetic blow outs.

Controllers located in engine spaces should be designed for operation on the basis of 50 degrees Cent. ambient temperature, but for other locations in the vessel they may be designed on a basis of 40 degrees Cent. ambient temperature.

Manual type controllers are used generally for operation of auxiliary motors of small horsepower rating, usually not in excess of 7½ horsepower. They consist of hand type starters for bringing the motor up to the required speed. The design includes a drip proof sheet steel enclosure in which is mounted an asbestos lumber panel on which are provided a line knife switch, an overload device, a line contactor, low voltage protection being included. The starting arm is so arranged that the motor will be stopped if the arm is left on a starting point. This type of starter is used with motors for machine shop, refrigeration, oil separators, etc.

Using Drum Type Controllers

Drum type controllers for under deck applications are used only to a limited extent, and probably the most frequent applications are those for engine turning and certain machine tools. The drum type control consists essentially of a rotating drum cylinder with a series of copper segments, a set of drum fingers mounted on a common supporting finger board, the fingers being insulated from each other. By means of a radial drive handle the cylinder is rotated cutting into or out of circuit the various fingers and segments, and thus providing necessary speed regulation for the motor. A typical installation of a drum type control is shown in Fig. 1, this being the engine turning gear equipment used with motors rated at 20 horsepower 230-volts direct current compound wound, on the motorships Tidewater and Tidewater Associated, for the Tidewater Oil Co. These vessels were recently completed by the Sun Shipbuilding & Dry Dock Co. Particulars of the first are given on page 23. The control includes a drip proof protecting panel which provides overload and low voltage protection, a non-watertight reversible drum controller, and

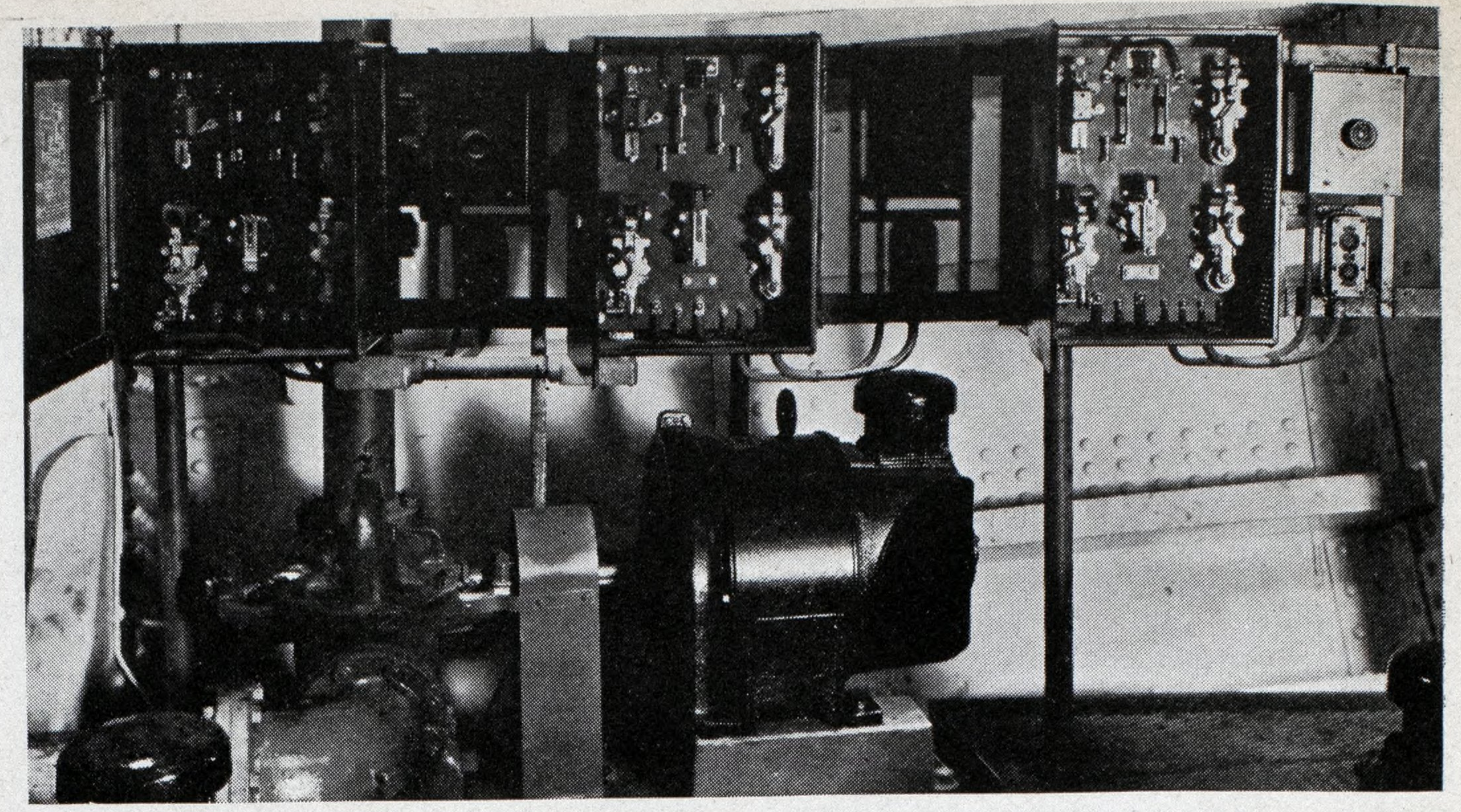


Fig. 2—Panels A & C (Left & Right) Controls for Fresh Water Circulating Pumps on the M. S. Tide Water & Tide Water Associated Center Panel for Salt Water Circulating Pump

a set of open type zinc plated grid resistors, the complete equipment being designed for ½-hour intermittent duty rating.

Automatic type controllers are in general use for under deck auxiliary applications. It is the usual practice to provide two general types, semi-automatic and full automatic. In the semi-automatic type, the time period of starting the motor is not controlled by the operator, but is automatically accomplished by means of contactors or relays designed and calibrated to close in proper order. The motor circuit is closed in the case of remote control by a suitable waterproof or drip proof push button station and in the case of local control by means of a push button located on the panel, or a local knife switch mounted on the panel. In the full automatic type control, the design of the controller is similar to the semi-automatic type with the exception that the starting and stopping is controlled by some master device such as a pressure gage or float switch.

Usually for under deck applications magnetic controllers are of the drip proof type, designed for bulkhead mounting. Where it is desired in the case of adjustable speed motors to have the field rheostat located convenient to the driven auxiliary, such as an adjustable speed motor for driving a pump, with the controller located at a distance, a separate drip proof or waterproof type field rheostat is used.

In automatic controllers of larger sizes, usually in excess of 15 horsepower it is frequently desirable to take current readings of the motor and to do this conveniently a test link is provided on the individual control panel.

Of the most recent and interesting installations of magnetic type controllers for under deck auxiliaries are those on the motorships Tidewater, and Tidewater Associated. These ships have two fresh water motor-driven circulating pumps of the centrifugal type. The driving motors are rated at 25 horsepower 230-volts direct current 1400/1850 revolutions per minute, with adjustable speed. Each control equipment consists of a drip proof semi-automatic magnetic type control panel

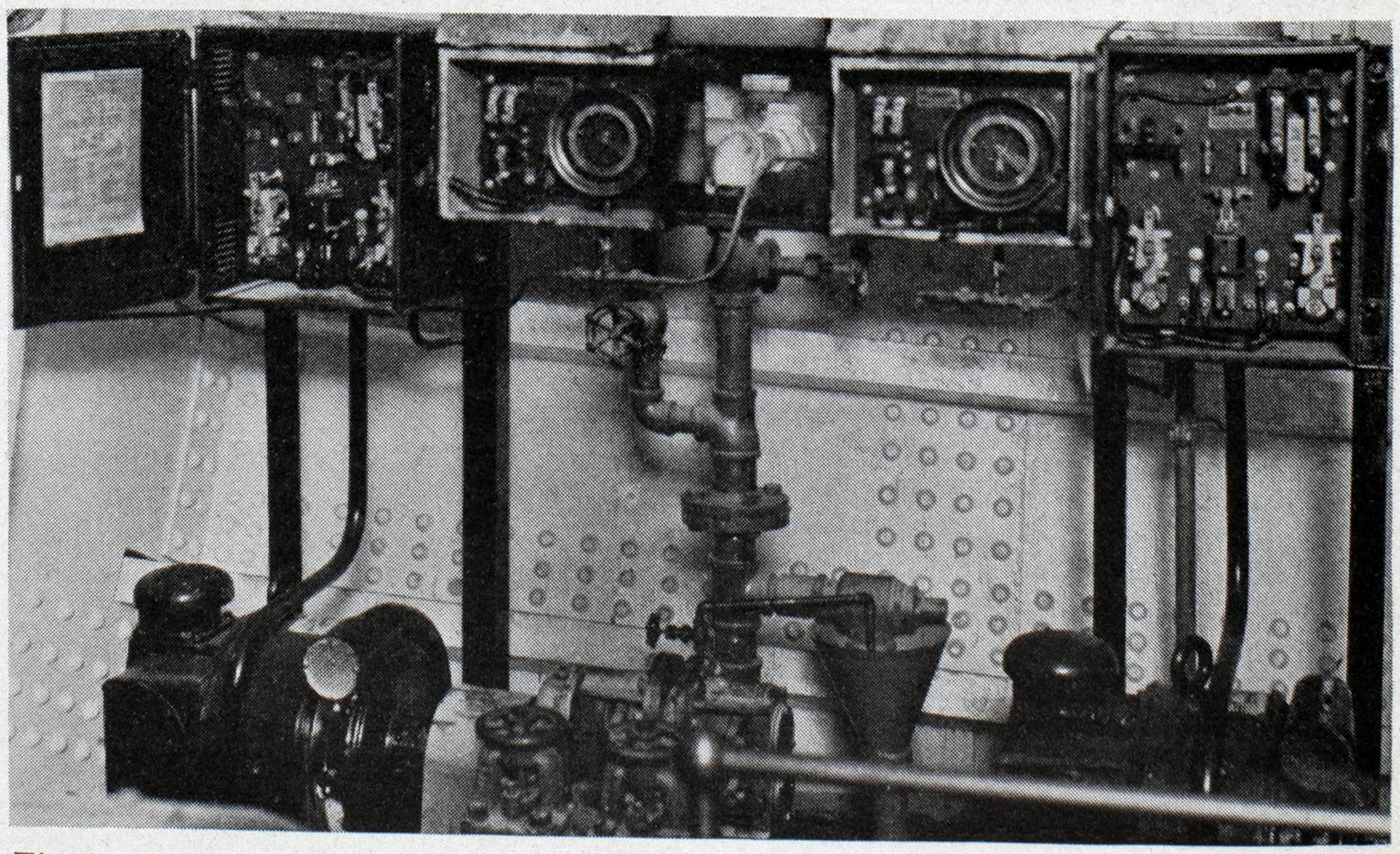


Fig. 3—Controls for Fresh Water Pump Motors (5 H.P.) on M. S. Tide Water & Tide Water Associated—Full Automatic Contactor Type in Drip Proof Enclosures

with remote control by a 3-wire watertight push button station. The panels are of asbestos lumber and each contains a line knife switch, double pole, unfused, an adjustable overload relay, a line contactor, necessary magnetic lockout accelerating switches, and a vibrating field relay the function of which is to prevent injury to the motor when starting up under weak field. For speed adjustment a separately mounted drip proof field rheostat is installed which provides adequate points of speed control. The installation is illustrated in Fig. 2, panels A and C.

Control Equipment in Detail

For the salt water circulating pump, this being also of the centrifugal type, the electrical equipment has the same rating as for the fresh water pumps, and the control tion is provided. The panel includes a line knife switch unfused, an adjustable overload relay with hand reset, a double pole line contactor, a lockout accelerating contactor. The resistors are of the unit type and are mounted on the rear of the panel.

There are two fresh water pumps of the centrifugal type each operated by a drip proof motor rated 5-horsepower, 230-volts, 1150 revolutions per minute constant speed. The controller for each motor consists of a full automatic contactor type control in drip proof sheet steel enclosing case and a separately enclosed drip proof panel with automatic control of the motor by means of a gage type pressure regulator. Each control panel includes a double line knife switch unfused, a double pole line contactor, a magnetic lockout accelerating contactor, and

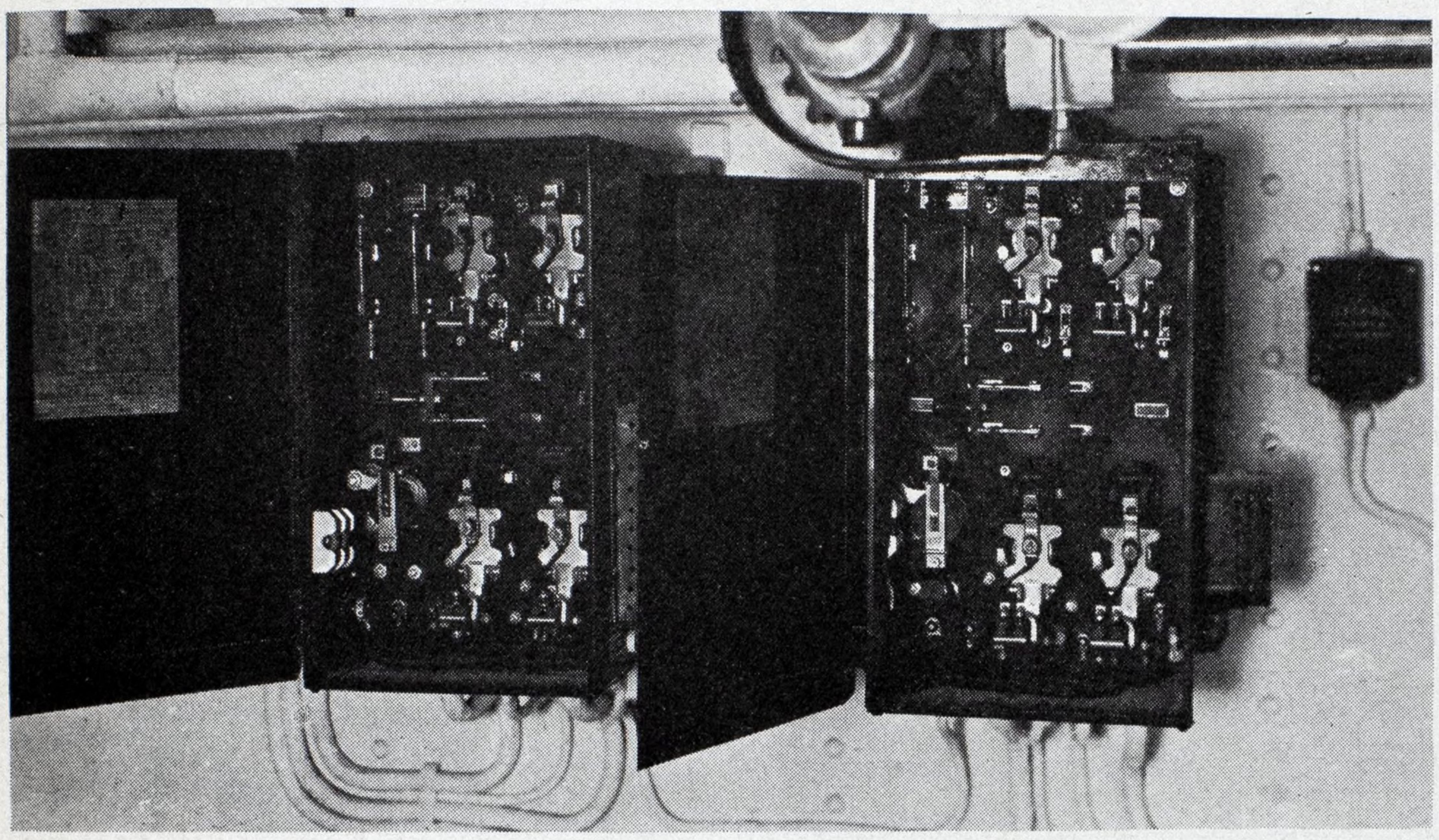


Fig. 4—Steering Gear Motor Controls on M. S. Tide Water & Tide Water Associated

equipment is similar. It is shown as the center panel Fig. 2.

The air compressor is operated by a 45-horsepower 230-volt direct current 375 revolutions per minute, constant speed motor, and the control is of the drip proof type, semiautomatic, magnetic lockout acceleration. The panel is asbestos lumber and mounted on same are a double pole line knife switch unfused, a line contactor, necessary lockout accelerating contactors, and an adjustable overload relay. Remote control is provided by means of a watertight 3-wire, push button control station. The panel includes low-voltage protection.

The fuel oil purifier pump is also of the centrifugal type and is operated by a 5-horsepower, 230-volt, direct current 1650/1900 revolutions per minute drip proof motor. The control consists of a drip proof magnetic control panel with separately mounted drip proof field rheostat mounted on the side of the control enclosing case. A separate watertight remote control push button sta-

the resistors are mounted on the rear of the panel. The equipment as installed is illustrated in Fig. 3.

On these two motorships there are also a number of other under deck motor driven auxiliary pumps, such as the combined fire and ballast pump, the sanitary and ice machine pumps, the engine room bilge pump, and the fuel oil transfer pump. The controllers are generally similar to those described above.

Controls for Steering Gear Motors

For operating the two steering gear motors (equipments being in duplicate), each rated 20 horsepower, 230-volts, direct current, shunt wound, two magnetic drip proof type control panels are used as shown in Fig. 4. These panels are arranged for bulkhead mounting. Each is of the drip proof enclosed type, and the equipment on each panel includes a line knife switch unfused, jam relay protection, which automatically acts when load exceeds 200 per cent of normal, and causes resistance to be inserted in series with the motor armature so that the current will be limited to approximately 125 per cent of normal, with motor at rest. Normal functioning is automatically restored as soon as current falls to 100 per cent. The panels are each equipped with necessary magnetic lockout accelerating contactors, and is fitted with a two pole, double throw, transfer knife switch for transferring from one control to the other. Remote operation of each panel is provided by two improved type watertight push button remote control stations connected in parallel, one in the engine room and one in the wheel house. The resistors are of the unit type, non-fragile, and are mounted in the rear of the control panel.

All of the automatic controllers described above include pilot fuses for the protection of pilot circuits where the control circuits leave the control panels. The motors were all supplied by the General Electric Co., and the control apparatus by Cutler-Hammer Inc., all equipment conforming to American Institute of Electrical Engineers marine rules.

Sale of Line Authorized

The shipping board, Sept. 26, approved the recommendation of the merchant fleet corporation, and accepted the offer of the Southgate-Nelson Corp., on behalf of a corporation to be organized for the purchase of the trade name and good will of the American Hampton Roads line, together with the following five vessels: City of Flint, 7840 d.w.t.; Lehigh, 7825 d.w.t.; Quaker City, 7840 d.w.t.; Capulin, 7825 d.w.t.; Brush, 7825 d.w.t.

The price bid was $60,486 per vessel.

The bid was accepted on the provisions that the purchaser enters into usual contract, as approved by the general counsel, guaranteeing to operate these vessels between United States North Atlantic ports, north of Hatteras, to ports on the East Coast of United Kingdom, excepting between the ports of New York and London, east and westbound, and to make not less than 24 outward voyages per annum of which not less than two shall be made in each and every month and, provided further, that the financial responsibility of the corporation to be organized shall be satisfactory.

The new steel diesel lighter 35, recently built at the Mariner's Harbor plant of United Dry Docks Inc., for the New York Central railroad, developed a speed in excess of 13 miles an hour on her trial trip on the Hudson river. She is powered with an Ingersoll-Rand 600 horsepower marine diesel engine and is 123 feet long, 32 feet 6 inches beam and 14 feet 6 inches deep.

Mail Contracts Corrected to Date

Thirty-Nine Mail Contracts Awarded—Means Payment of $20,-954,346 Annually—Seventy-Seven Ships Must Be Built as Specified

Ocean Mail Contracts Awarded to American Steamship Lines to Oct. 15, 1930

Route Number	Steamship Cos. & Termini	Class of Vessels Required at Start of Service	Annual Payment on Service Now Performed	Class of Vessels Required to be Substituted
4	**Munson Steamship Lines** New York to Buenos Aires	Class 3—18 knots—12000 tons	$1,253,200.00	None
5	**Export Steamship Corp.** New York to Mediterranean and Black Sea Ports	Class 6—10 knots—4000 tons	1,800,250.00	Six vessels of Class 5—13 knots—Ordered from New York Shipbuilding Co. Two have already been launched, Excalibar and Exochorda, next two to follow on same ways.
6	**American South African Line** New York to Beira, Portuguese E. Africa	Class 6—10 knots—5000 tons	285,522.00	One new vessel of Class 5—13 knots—6,000 tons within two years and one additional after fifth year—First vessel, City of New York, diesel engines, now in service.
8	**Grace Steamship Company** New York to Valparaiso	Two of Class 4—16 knots Others of Class 5—13 knots	1,404,586.00	One new vessel of Class 4 in service—Santa Barbara, within one year and one additional new vessel of same class within three years after award of contract—First vessel, Santa Clara, Class 3 vessel in place of Class 4, completed and in service.
10	**New York & Porto Rico SS Co.** San Juan to Santo Domingo City	Class 5—13 knots—8000 tons	46,176.00	None required—But New Borinquen ready Jan. 1, '31.
15	**Eastern Steamship Lines** Boston to Yarmouth	Class 3—19 knots—5000 tons	225,624.00	Two to be ordered—See M. R. June, page 43. Also July issue, page 60.
16	**American Scantic Line** New York to Copenhagen	Class 6—10 knots—4000 tons	583,700.00	Eight vessels of Class 6, 12 knots—4,800 tons, two within 15 months from award of contract; one additional within the succeeding 15 months and one additional each 18 months thereafter. All speeded up to better than 13 knots. Payments still made on basis of Class 6.
17	**American West African Line** New York to West African Ports	Class 6—10 knots—4500 tons	287,850.00	Three vessels of Class 5—14 knots—4,000 tons. One within the fourth year from the award of contract and two during remainder of the contract.
18	**Atlantic & Caribbean Steam Navigation Co.** New York to Maracaibo	Two of Class 5—13 knots Others of Class 6—10 knots	375,878.00	After completion of the third year of the contract, one additional vessel of Class 5—13 knots—3,000 tons. Possibly one ordered.
20	**New York & Cuba Mail SS Co.** New York to Havana	Class 4—16 knots—6000 tons	569,280.00	Two new vessels of Class 3—18 knots. These two vessels, the Morro Castle and Oriente, turbine electric drive, have been launched, will enter service in fall. Permission granted for vessels of Class 2 instead of 3. One vessel, Morro Castle, now in service. Second, Oriente, nearly ready.
21	**New York & Cuba Mail SS Co.** New York to Progreso	Class 5—14 knots—4500 tons	419,536.00	One vessel of Class 5—15 knots—6,000 tons within three years from the award of the contract.
22	**Gulf Mail Steamship Co.** New Orleans to Pregreso, Mexico	Class 6—10 knots—3000 tons	23,619.00	One Class 5—13 knots in 3 years.
23	**Lykes Bros. Steamship Co.** Galveston to Santo Domingo	Class 6—10 knots	274,974.00	One vessel of Class 5—13 knots—4,000 tons within 4 years from award of contract. Now in service—Margaret Lykes.
24	**The Oceanic Steamship Co.** San Francisco to Sydney	Class 4—16 knots—4000 tons	692,886.00	Two new vessels of Class 3—18 knots, 631 feet in length, to cost $7,000,000 each under construction at Bethlehem Ship Building Corp., Quincy, Mass.
25	**Dollar Steamship Line** San Francisco to Manila	Class 3—18 knots—12000 tons	1,262,664.00	None
26	**Admiral Oriental Line** Seattle to Manila	Class 3—18 knots—12000 tons	1,070,784.00	None
27	**Dollar Steamship Line** San Francisco to Colombo	Class 5—14 knots—10000 tons	1,141,296.00	Four new vessels of Class 3—18 knots, 12,000 tons. Two of these, 653 feet in length, turbine electric machinery 21 knots, are under construction at the Newport News Shipbuilding & Dry Dock Co.
28	**States Steamship Company** Portland to Manila	Class 6—10 knots—4000 tons	399,540.00	Two vessels of Class 5—14 knots—4,000 tons. One during the 4th year of the contract and one during remainder of contract.
29	**States Steamship Company** Portland to Dairen, China	Class 6—10 knots—4000 tons	184,440.00	One, of Class 5—14 knots—4,000 tons.
30	**Oceanic & Oriental Nav. Co.** Los Angeles to Auckland	Class 6—10 knots—4000 tons	169,740.00	None
31	**Oceanic & Oriental Nav. Co.** Los Angeles to Melbourne	Class 6—10 knots—4000 tons	210,960.00	None
32	**American Line Steamship Corp. (Panama Pacific Line)** New York to Balboa, Canal Zone	Class 5—13 knots—7500 tons	418,496.00	3 vessels of Class 3—18 knots, not less than 12,000 tons. Three vessels, Virginia, Pennsylvania, and California completed and in service.
33	**South Atlantic SS Co. of Del.** Savannah, Ga., via Brest to Liverpool; Savannah, Ga., via Plymouth to Bremen	Class 6—10 knots—4900 tons	357,840.00	3 vessels of Class 6—12 knots—3,000 tons; one during 4th year; one during 7th year; one during 9th year.
34	**Pacific Argentine Brazil Line** San Francisco and Los Angeles via Bahia Blanca to Buenos Aires	Class 6—10 knots—4000 tons	303,922.00	Additional vessels of Class 6 to provide 18 trips per annum, not later than third year of contract.
36	**Tacoma Oriental Nav. Co.** Tacoma to Taku Bar Tacoma to Manila	Class 6—10 knots—4500 tons	347,679.00	One vessel of Class 5—13 knots—5,000 tons during 5th year of the contract and one additional vessel of Class 5 at such time as the postmaster general and the contractor may mutually agree may best serve the route.
		Total....................	$13,835,823.00	

Note: Total annual payment on mail contracts up to Oct. 15, 1930 as per table on these two pages is $20,954,346.00

(*Continued on Next Page*)

Ocean Mail Contracts Awarded to American Steamship Lines to Oct. 15, 1930

(Continued from Preceding Page)

Route Number	Steamship Company and Termini	Class of Vessels Required at Start of Service	Annual Payment on Service Now Performed	Class of Vessels Required to be Substituted
19	**Columbian Steamship Company** New York to Puerto Colombia	Class 6—10½ knots—2550 tons	$280,410.00	3 Class 4—16 knots, two of which at least shall be new. One new vessel not later than end of 3rd year and one new vessel not later than end of 4th year and a 3rd vessel not necessarily new not later than end of 5th year.
35	**Mississippi Shipping Co.** New Orleans and other Gulf Ports to East Coast of South America	Class 6—10 knots—4900 tons	641,035.00	Two Class 5—13 knots, 4900 tons within one year from beginning of service and two additional such vessels within two years from beginning of service.
37	**Panama Mail Steamship Co.** San Francisco to Puerto Colombia	Class 5—13 knots—4500 tons	407,576.00	2 new Class 3 vessels within 3 years from beginning of service.
38	**Grace Steamship Company** Tacoma to Valparaiso	Class 6—10 knots—4000 tons	270,300.00	One new Class 3 vessel within 3 years from beginning of service.
39	**United Fruit Company** San Francisco to Puerto Armuellas	Class 6—11 knots—3200 tons	392,470.00	3 new vessels of Class 4 within 3 years from beginning of service. First vessel laid down at Newport News Shipbuilding Co. Other two to follow in due course.
40	**United Fruit Company** New York to Limon	Class 5—13 knots—7200 tons	347,626.00	3 new vessels of Class 4 not later than 3 years from date of award of contract. First vessel laid down at Bethlehem Shipbuilding Co. Other two to follow in due course.
41	**United Fruit Company** New Orleans to Puerto Colombia	Class 6—11 knots—3200 tons	252,460.00	2 new vessels of Class 4 within 5 years from date of award of contract.
42	**United States Lines** New York to Southampton	Class 1—24 knots—45000 tons	616,128.00	2 new vessels of Class 1—28 knots not later than 4 years from date of award of contract.
43	**United States Lines** New York to Hamburg	3 Class 3—18 knots 1 Class 4—16 knots 1 Class 5—14 knots	1,381,608.00	2 new vessels of Class 2 not later than 5 years from date of award of contract. Contract awarded New York Shipbuilding Co. for two 705-foot 20 knot cabin liners.
44	**United States Lines** New York to London	Began service with Class 4—16 knots—7000 tons	1,055,184.00	Term of contract 5 years to be automatically extended for an additional 5 years if contractor agrees to construct 2 new vessels of Class 3 or reconstructed vessels within 3 years after extension.
46	**Roosevelt Steamship Company** Baltimore to Hamburg	Class 4—16 knots—7000 tons	1,275,144.00	By agreement of contractor and postmaster general after 5 years postmaster general may require 2 new vessels of Class 3.
47	**American West African Line** New Orleans to Ports on West African Coast	Class 6—10 knots—4000 tons	147,340.00	After three years two new vessels or two additional vessels of such class or classes as the postmaster general may determine after consulting with contractor.
48	**Oceanic & Oriental Navigation Co.** San Francisco to Dairen, Manchuria	Class 6—10 knots—4000 tons	316,587.00	Two new vessels Class 5—13 knots—8,000 tons—one within three years and other within 7 years.
49	**Oceanic & Oriental Navigation Co.** San Francisco to Saigon, Indo-China	Class 6—10 knots—4000 tons	375,690.00	Two new vessels Class 5—13 knots—8000 tons—one within five years and other within 9 years.
	Total Annual Payment Mail Contracts on this Page		$7,118,523.00	
	Total Annual Payment Mail Contracts on Preceding Page		13,835,823.00	
	Total Annual Payment All Mail Contracts		$20,954,346.00	

Port Improvement at New Orleans About to Begin

The board of commissioners of the port of New Orleans have announced the completion of plants for the construction of a series of piers, slips and warehouses on the industrial canal at a cost of several million dollars. Work on the first two units of the expansion program is expected to start before the end of this year. The program is the most sizeable to be undertaken since 1922 when the industrial canal itself was completed at a cost of $18,700,000. When completed, the entire new project, it is said, will take care of the dock, wharf and warehouse expansion for a period of 20 years.

The canal's west bank will be the site of the new piers. Slips will be dredged back into the land at an approximate angle of 45 degrees. They will be 30 feet deep and wide enough for two ocean liners to enter side by side. Their length will be from 1600 to 2200 feet, providing for two, three, four or five ships' simultaneous docking.

Modern five-story concrete and steel warehouses will be erected down the center of the piers. They will accommodate loading and unloading operations, give storage space and expedite shipping.

The earth taken out in the slip dredging will be dumped and stacked for the rail lines of the Public Belt and the Gulf, Mobile & Northern Railroad of Louisiana. These lines will operate in conjunction with the facilities provided in the canal program. Every possible item of modern equipment will be utilized throughout the port building program. The latest elevators, conveyors, etc. will be used.

Abel I. Culver, former president of the Hudson Navigation Co. and a specialist in financial investigations, died at his home in Montclair, N. J. on Oct. 23 after a short illness. He at one time headed a steamship line to Bermuda.

Dedicate Memorial to George Westinghouse

The George Westinghouse memorial erected in Schenley Park, Pittsburgh to the memory of George Westinghouse, the founder of the Westinghouse Electric & Mfg. Co., was dedicated Oct. 6 with very appropriate ceremonies attended by many distinguished figures in the fields of science and industry. The contributions of this great genius to mariners all over the world have made navigation easier and safer. The principal address at the dedicatory services was that by James Francis Burke of Pittsburgh, former congressman and general counsel of the republican national committee.

Many tributes to the greatness of George Westinghouse have been uttered by prominent industrial and scientific men among them: David Sarnoff, president of the Radio Corp.; Thomas A. Edison; M. S. Sloan, president New York Edison Co.; S. M. Vauclain, Baldwin Locomotive Works.

Latest Data on New Marine Work

Information on New Ships Ordered—Building and Repair Contracts Let—Shipping Board Loans Made, Authorized or Pending

ON SEPT. 1, 1930, American shipyards were building or were under contract to build for private shipowners 251 steel vessels of 478,592 gross tons, compared with 253 steel vesels of 453,600 gross tons, on Aug. 1, 1930, according to the bureau of navigation, department of commerce.

There were 27 wood vessels of 10,329 gross tons building or under contract to build for private shipowners during the same period compared with 29 wood vessels of 11,019 gross tons on Aug. 1, 1930.

To Build Two New Liners

Two 20,000-ton passenger and cargo motor ships are planned by the Navigazione Libera Triestina for the North Pacific-Mediterranean trade. The vessels are to cost about $2,500,000 each and are to be laid down at Trieste early next year and are to be ready for service early in 1932. They are to have accommodations for 300 cabin passengers each in addition to ample refrigerated space for fruits and other perishable cargo. They are to have a service speed of 17 knots.

McClintic-Marshall Co., Riter-Conley Works, was awarded a contract from the Gulf Refining Co. for the construction of eight oil barges for the Ohio River trade. These barges will be each 150 feet long, 35 feet wide and 10.3 feet deep. They will have a total capacity of 335,000 gallons and will be fully equipped with pipes and pumps to permit rapid discharge.

Launch Standard Oil Tanker

The Standard Shipping Co.'s new bulk oil tanker W. S. Farish, was launched Oct. 11 at the Kearny, N. J. yard of the Federal Shipbuilding and Dry Dock Co. Mrs. W. S. Farish acted as sponsor before a large gathering of officials and friends.

This latest addition to the Standard Shipping company's fleet is a sister ship to the G. Harrison Smith recently delivered. This ship is one of the most modern bulk oil carriers afloat, being built on the bracketless system of longitudinal framing, while the application of high steam pressures and temperatures to her machinery is in accordance with the most progressive developments in marine propulsion. Her cost is about $2,000,000.

Navy Awards Contract for Aircraft Carrier

The contract for the navy's new 13,800-ton aircraft carrier has been awarded to the Newport News Shipbuilding and Drydock Co., Assistant Secretary of the Navy, Ernest Lee Jahncke, announced Oct. 17. The cost of hull and machinery will be $15,560,000, and the total expense will be "around $19,000,000."

This new ship, which will provide accommodations for about 75 planes with a considerable number in reserve, will be the first aircraft carrier constructed since the Washington treaty was ratified in 1923, it was explained orally by chief of the bureau of aeronautics, Rear Admiral William A. Moffett.

Armor and armament for the new ship, which will cost approximately $3,440,000, will be constructed by the department.

Bids for the carrier were opened Sept. 3, three companies competing for construction. The limit of cost for the carrier, including armor and armament, was set by the authorizing act of Feb. 13, 1929, at $19,000,000. The navy department arbitrarily set the limit of cost for hull and machinery at $14,600,000, setting aside $4,400,000 for armor and armament. The lowest bid received on Sept. 3 for hull and machinery was $15,560,000.

During the first six months of 1930, according to recently published statistics, 61 ships of 99,234 gross tons were laid down in Italian yards and 66 with a gross tonnage of 50,293 were launched. These are the highest figures reached in the past four years.

Navy Yard to Build Cruiser

The light cruiser No. 38, one of the two remaining 10,000-ton eight-inch gun cruisers on which construction may commence prior to 1933 under terms of the London treaty, will be built by the navy yard, Mare Island, Calif., the navy department announced Oct. 15.

Plans for the cruiser, which is as yet unnamed, will be forwarded immediately to Mare Island from the navy's central drafting office at the navy yard, New York. Appropriations for the assembly of material incident to laying the keel have been allotted the Mare Island yard by the navy department.

Light cruiser No. 38 is the first cruiser to be started in the second block of five authorized in the fifteen-cruiser program of Feb. 13, 1929.

Bids for Four Vessels

Bids have been received from three companies for construction of four vessels for the Panama Mail Steamship Co. and the Grace Steamship Co. The owners have applied to the shipping board for a loan covering three-fourths of the cost of construction. The bids are as follows: New York Shipbuilding Co. for four turboelectric vessels $15,960,000 fitted with electric winches and $15,868,000 fitted with steam winches; the same company for the four ships with double reduction gear drive $15,887,000 fitted with electric winches and $15,797,000 fitted with steam winches; the Bethlehem Shipbuilding Corp. for four turboelectric ships if fitted with electric winches $16,241,000 and steam winches $16,153,000; the same company if double reduction gear equipment and electric winches $16,015,000 or steam winches $15,927,000. The Federal Shipbuilding & Dry Dock Co. for four ships if turbo electric drive and fitted with electric winches $15,920,000 or steam winches $15,830,000; the same company for the four vessels with double reduction gas equipment $15,692,000 if fitted with electric winches and $15,602,000 if fitted with steam winches.

To Be Largest Carferry

What is to be the largest car ferry in the world, will operate in the Mississippi river between Avondale, La., and Harahan, Miss. The American Bridge Co. is completing the construction of a section for this carferry which will transfer trains of the Southern Pacific Railroad across the Mississippi river. This section, which is 144 feet long, 50 feet wide and 11 feet deep, will be towed to its destination by the American Barge line. On its arrival at New Orleans the Johnson Iron works will cut the existing ferry, which has a length of 308 feet, in half and insert the new section. When the ferry is completed it will have a total length of 452 feet.

Tanker Virginia Sinclair Launched at Quincy

The first American tanker to be built with double longitudinal bulkheads in lieu of the single center-line bulkhead was launched Oct. 9 at the Fore River plant of the Bethlehem Shipbuilding Corp. Quincy, Mass. The vessel was christened by Miss Virginia Sinclair, in whose honor the ship was named.

The vessel, which was built for the Sinclair oil company, is said to mark an advance over previous American and European tanker design. Advantages claimed are greater stability, higher speed, virtual elimination of fire hazard, decreased evaporation losses, elimination of cargo contamination, and reduced construction and operating costs. Sinclair officials point out also that as a result of the higher speeds, the company will be able to reduce the average storage at terminals.

Methods and practices ordinarily used on naval cruisers and transatlantic liners are applied to hull design so far as these have been found adaptable to commercial service. Since the lines are faired and fine, minimizing eddy losses and greatly reducing hull resistance, the 5000 horsepower driving machinery will permit a sea speed of 14 knots.

Other features are summarized by the Sinclair engineers as follows: Summer tanks eliminated. Isherwood bracketless system of construction, iron rivets throughout, to decrease corrosion, sprinkling system covering entire deck, cargo tanks fitted to withstand higher pressures; vents at top of mast and fitted with flame-proof spark arrestors, special methods of cleaning tanks, vertical compound duplex steam pumps of high capacity, three pump rooms and three cofferdams, with separate lines and pumps to each cargo compartment, double reduction gear turbines; steam generated in water-tube boilers at pressure of 400 pounds and with 200 degrees of superheat; engine room auxiliaries electrically operated; feed water heated in series heaters; Gyro compass; mechanical steering device; full radio equipment for sending and receiving; compass direction, etc.

Coast Guard Plans

To provide a fleet to cope with rum-runners, the coast guard has turned to designers of some of the swiftest liquor ships now operating off the coasts.

Only general outlines of the new boats were laid down by the coast guard. Details are to be worked out by the designers and submitted. They are to be 75 feet long, have twin screw propellers, and a single one-pounder, radio and searchlights.

It is estimated that the new vessels, which will be much like the submarine chasers used during the war, will cost about $40,000 each.

The new boats will be built by outside shipbuilders, and their construction will be part of the building program authorized by congress. Bids were to be opened in Washington, Oct. 28.

Of the thirty-three 30-foot patrol boats, authorized for use against rum-runners on the Great Lakes, more than half of them have been delivered or are in service.

Building Loan Authorized

The shipping board has authorized a loan not to exceed $5,887,500 covering three-fourths the construction cost of a passenger-cargo steamer to be built for the Oceanic Steamship Co., of San Francisco, at the Bethlehem Shipbuilding Co. yard at Fore River, Mass. The total cost of the vessel will be $7,200,000, in addition to a cost of $650,000 for hotel equipment, furnishings and fixtures. The ship will be identical with two other ships now building at Fore River, and when completed will also be placed in service in the California-Australia route maintained by the company.

The vessel will be of approximately 11,300 deadweight tons and will be capable of 20-knot speed.

The tanker Virginia Sinclair leaving the ways at Fore River plant of Bethlehem Shipbuilding Corp.

Overhaul Cunard Liner

Contract for overhauling the propulsion machinery of the Cunard liner Carinthia has been awarded to Vickers, Ltd., Barrow-in-Furness. The alterations are to be effected to reduce fuel consumption and increase the speed of the vessel.

Unique Features in Tender for Lighthouse Service

Engineering features never before found in a vessel of this size are planned for a new diesel-driven lighthouse tender, for which the keel has just been laid at Jacksonville, Fla., according to an announcement Oct. 1 by the Deputy Commissioner of Lighthouses, H. D. King.

The statement, made public by the department of commerce, follows:

The marine engineering division of the lighthouse service points out that the salient feature of this new vessel is its diesel electric propulsion equipment, decided upon because of its successful application to other types of

In the new tender, to be known as the Linden, two large diesel engines generate electric current, the current in turn driving the single electric motor mounted upon the propeller shaft. When the vessel is tied up at the dock, the engines are shut down, fuel consumption stopping immediately, but as the engines are quick starting, power is available at short notice.

When the tender is at work, the engines perform two functions, supplying current for driving the propeller, and also providing power for the hoisting gear. The work which these tenders perform requires the frequent use of the heavy lifting tackle mounted upon the forward deck. With its heavy boom, a tender of this size is able to raise a 10-ton buoy from the water, land building materials, or do other work incidental to the maintenance of aids to navigation.

With the Linden, when the ship is not under way, but is working around a buoy, the main engines idle with a very low consumption of fuel. When power for either the hoister or main engine is needed, more fuel is fed to the engine and current is instantly available. The fact that electric current, generated by the engines, can be used for both propulsion and hoisting, makes this type of vessel particularly efficient and reduces the cost of operation.

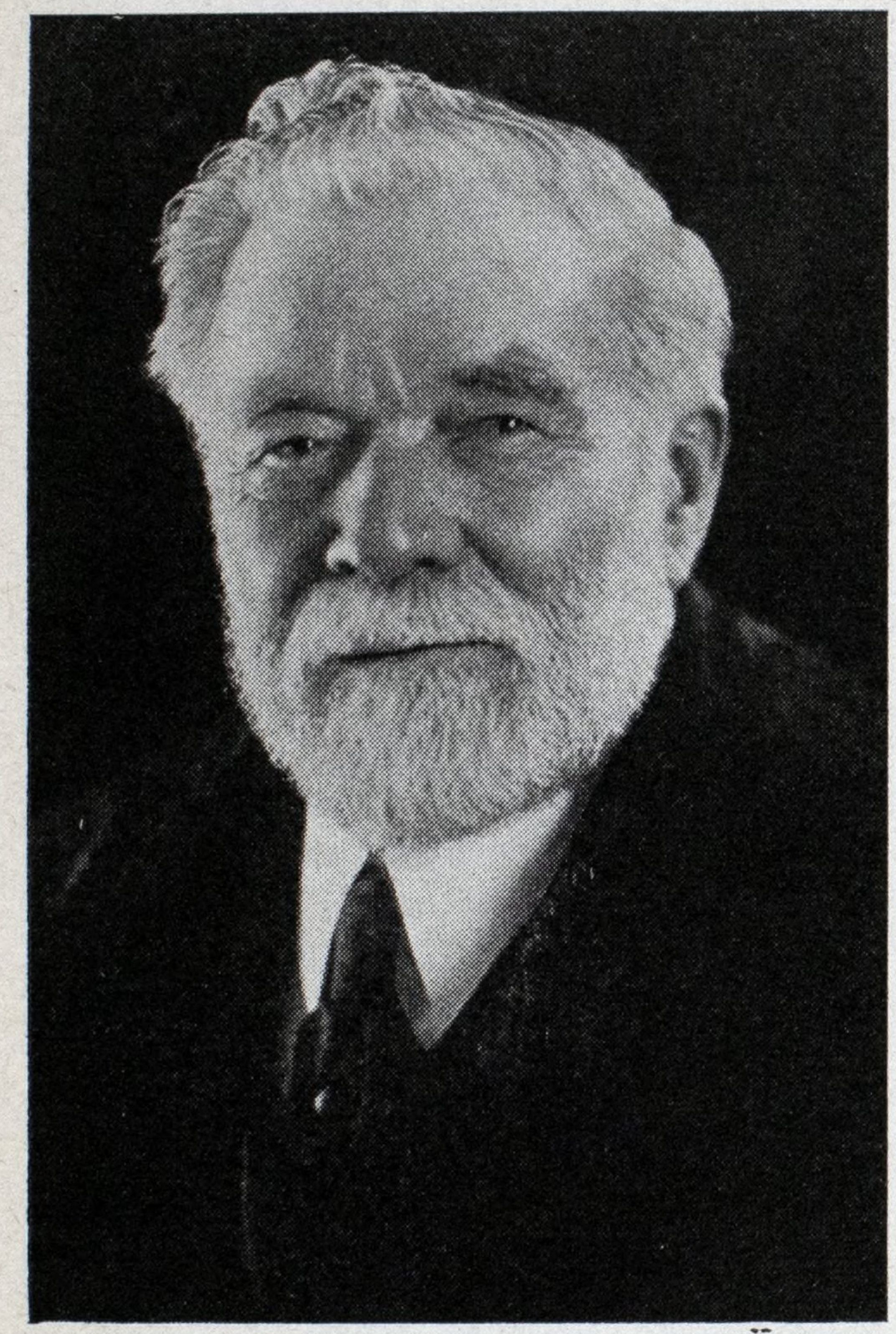
The Linden will be an all-steel vessel of 240 shaft horsepower, designed to take the place of the Laurel, an

Boston to Build Fireboat

Specifications for a new fire boat for the city of Boston are being prepared, and the contract for the construction will probably be awarded in the near future. The boat will be constructed of steel, with an overall length of 125 feet, molded beam 28.2 feet, extreme width 29.6 feet, draft 10.6 feet. The boat will have a speed of 12 knots, or 14 statute miles. She will be equipped with four pumps, each with a capacity of 2500 gallons per minute. It is expected the new boat will be completed and ready for commission in about eight months.

Dedicate Memorial Lighthouse to William Livingstone

THE Livingstone Memorial lighthouse, erected at the extreme tip of Belle Isle, Detroit, to the memory of William Livingstone, who for nearly a quarter century was president of the Lake Carriers association, was dedicated Oct. 17, the fifth anniversary of his death. This lighthouse is a solid shaft of Georgia marble, 58 feet in height and costing approximately $100,000. The light, which is incandescent occulting white every ten seconds is 8600 candlepower and can be seen a distance of 15 miles. Construction was started some eight



The late William Livingstone

months ago, the expense being borne half by the Lake Carriers association and half by Detroit business men. A delegation from Cleveland of 25 members of the Lake Carriers association and friends of Mr. Livingstone headed by J. S. Ashley, president of the Lake Carriers, attended the dedicatory services. More than 500 people, including members of the Livingstone family and many civic leaders of Detroit, witnessed the ceremony. The lighthouse was presented to the city of Detroit by Charles Beecher Warren, ambassador elect to Japan, and was accepted on behalf of the city by Mayor Murphey in a speech in which he called attention to the outstanding civic consciousness of William Livingstone. H. J. King, deputy commissioner of lighthouses, spoke on behalf of the service and its acceptance of the perpetual care of the light as an aid to navigation. George A. Marr, secretary and vice president of the Lake Carriers association made the principal address, and on account of its particular appropriateness as a tribute to this remarkable leader in lake transportation, it is quoted below in part as follows:

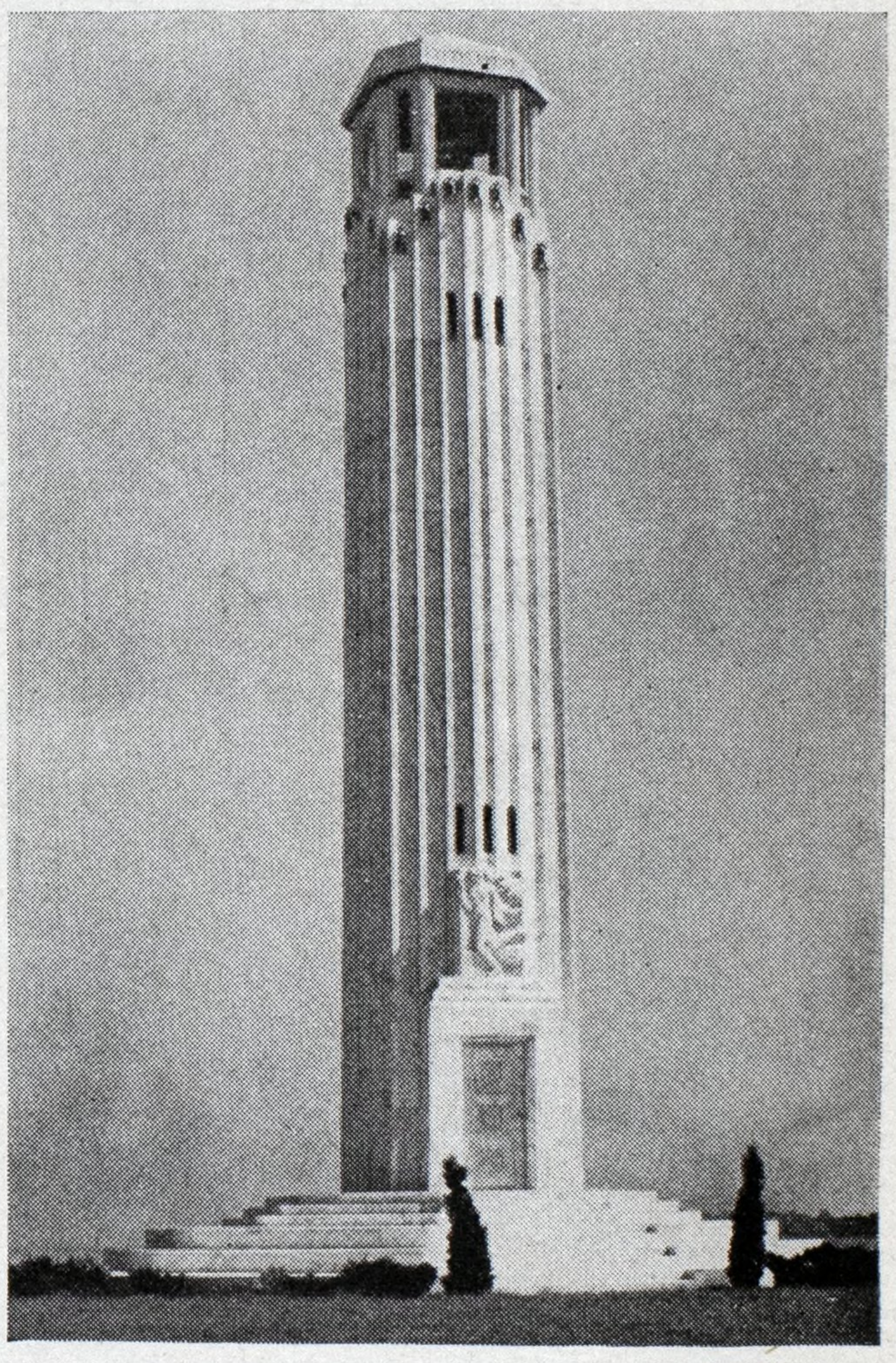
When by the grace of Divine Providence a man lives to the fullness of years attained by William Livingstone it is natural that those who labored with him throughout the many years of his fruitful activity shall have passed away one by one, leaving him standing alone like a monarch of the forest among the second growth of a later generation, and it is unfortunate indeed that there is none left of his generation able to speak from concurrent knowledge of the many accomplishments of his earlier life. It is regrettable that such a happy assignment can be given only to one who has enjoyed these relationships with Mr. Livingstone in the latter years of his life.

His connection with the lake shipping business began in 1866 when in company with his father, who had been a shipbuilder on the Clyde, he engaged in the chartering and operating of small vessels in the alongshore trade adjacent to Detroit. At that time navigation of the lower end of Detroit River was restricted to the one unimproved channel on the Canadian side of Bois Blanc island. In its natural state this channel had a normal depth of 12½ to 15 feet over a bottom of solid rock. Improvements made successively by the project of 1884, and later projects, have provided here a channel 22 feet deep with 25 feet now under consideration. Before the advent of the large vessels of the present day the need of greater navigation facilities in the connecting channels was apparent to him. Not only were deeper channels requisite but with the traffic growing at a rate exceeding the wildest expectations of even those engaged in the trade, he saw with uncanny foresight the necessity of separating upbound from downbound vessels in the narrow waters, and, sponsored by him, a channel, honoring his name, was created on the west side of Bois Blanc island providing a separate course for downbound ships, thus relieving the danger of collision in these narrow waters and safeguarding the commerce of the Lakes from the possibility of blockade thereby.

Among other improvements in the Lake Channels which Mr. Livingstone was instrumental in procuring may be mentioned the Lake St. Clair channel and the double channel at St. Clair Flats Canal, the channel through the lower ends of Lake Huron, improvement of the Middle Neebish Channel St. Marys River, the Poe, Davis and Sabin locks at Sault Ste. Marie, Stag Island Channel St. Clair River, Fighting Island Channel Detroit River.

His vigor and courage and his impatience with governmental red tape were indicated in the removal of the Port Huron Middleground. This middleground and the question of its removal were both of international character and upon ascertainment through international correspondence that both countries favored the removal of the shoal, Mr. Livingstone, impatient of the negotiations to determine the numerous details in carrying out the international willingness, put a dredge at work, had the shoal removed and let the details take care of themselves afterward.

It is very fitting that the City of



The William Livingstone Memorial

Detroit and the shipping interests of the Great Lakes should join hands in commemorating the fifth aniversary of the death of this very prominent public spirited civic leader of the city and pre-eminent citizen of the Great Lakes and benefactor of the Lake commerce.

It is very fitting that this monument to his memory should stand at the head of this beautiful island park which the City of Detroit purchased under his regime as the city's park commissioner, and where this magnificent lighthouse will in his name prolong through the ages the memory of his useful service to mariners begun and carried on during his span of life; and standing where it can always be looked upon by the citizens of Detroit and by the seamen of the Lakes as a beautiful and scintillating reminder of a lifetime spent in fruitful labors on behalf of both.

Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	591	2,877,309	556	2,693,493
August	554	2,716,668	586	2,855,323
July	578	2,717,787	616	2,815,336
June	585	2,722,344	559	2,596,692
May	592	2,697,642	643	2,955,826
April	558	2,662,532	574	2,601,047
March	546	2,490,027	562	2,470,228
February	508	2,280,543	512	2,272,393
January	542	2,506,444	572	2,658,125
December, 1929	517	2,331,342	518	2,257,424

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	87	232,781	52	147,365
August	92	244,206	55	144,201
July	96	246,866	68	151,861
June	92	240,323	72	169,627
May	105	271,618	64	143,167
April	89	236,257	63	177,289
March	96	285,754	58	190,093
February	86	248,417	67	194,809
January	94	281,558	66	202,453
December, 1929	87	237,510	49	143,761

Boston

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	118	347,974	85	249,605
August	115	305,649	101	299,454
July	152	325,325	110	222,555
June	152	325,325	110	222,555
May	163	362,849	114	274,019
April	105	298,347	76	203,497
March	85	271,423	57	193,317
February	87	281,012	44	159,767
January	93	306,097	42	128,581
December, 1929	95	286,749	62	208,978

Portland, Me.

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	32	53,423	28	49,428
August	36	69,765	36	72,282
July	42	83,987	42	84,939
June	39	70,119	34	60,536
May	31	46,797	33	52,619
April	17	47,308	20	52,313
February	26	71,155	21	57,834
January	27	72,734	26	71,929
December, 1929	22	47,329	23	51,644

Providence

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	6	28,972	3	16,265
August	7	29,532	4	16,388
July	10	36,403	5	19,623
June	6	26,588	4	18,640
May	7	28,953	6	23,794
April	10	44,564	6	24,407
March	7	31,668	5	23,382
February	12	44,382	7	28,774
January	13	48,880	5	24,055
December, 1929	10	35,615	4	16,406

Portland, Oreg.

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	30	122,022	46	182,641
August	32	125,137	46	174,985
July	30	118,919	53	193,425
June	31	122,569	48	175,167
May	32	122,714	49	179,845
April	32	121,646	46	167,358
March	26	103,710	44	159,420
February	31	123,100	47	185,192
January	31	122,031	44	165,208
December, 1929	39	146,486	53	118,117

Baltimore

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	150	475,928	138	424,976
August	130	412,209	125	396,421
July	132	444,823	144	455,226
June	153	486,645	157	481,837
May	152	457,169	150	463,958
April	166	502,204	179	529,912
March	141	438,638	139	433,168
February	139	432,422	142	431,664
January	131	422,932	135	435,506
December, 1929	134	415,201	134	425,362

Norfolk and Newport News

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	21	48,971	66	168,922
August	28	66,765	50	139,710
July	27	63,721	60	144,446
June	23	52,701	43	109,274
May	28	58,214	53	131,768
May, 1930	28	58,214	53	131,768
April	14	35,914	61	178,792
February	21	47,835	59	180,510
January	13	27,927	75	208,959
December, 1929	30	75,636	58	164,287

Jacksonville

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	12	26,442	13	26,356
August	15	29,565	12	20,856
July	6	14,312	8	20,739
June	10	25,129	12	23,737
May	14	32,001	19	51,210
April	13	23,378	13	27,999
March	17	26,625	12	23,963
February	14	35,002	13	31,353
January	12	24,225	16	31,722
December, 1929	19	36,831	12	20,409

Key West

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	48	64,968	48	64,742
August	50	61,440	50	61,666
July	56	68,968	55	69,397
June	57	69,679	56	68,653
May	104	120,788	108	120,160
April	89	90,105	82	90,249
March	93	89,490	76	86,235
February	85	90,050	70	87,109
January	74	86,081	71	85,990
December, 1929	68	78,984	65	78,634

Mobile

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	83	184,276	81	171,679
August	102	190,362	96	176,488
July	113	211,989	95	173,549
June	113	211,446	111	212,639
May	98	169,700	106	203,070
April	115	225,516	119	235,115
March	131	280,484	126	286,119
February	104	254,408	116	276,137
January	118	281,672	108	256,384
December, 1929	110	262,685	101	238,149

Seattle

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	62	268,203	58	250,301
August	48	200,602	48	209,109
July	54	248,954	60	261,746
June	49	215,525	53	228,554
May	54	235,178	53	222,715
April	55	230,429	55	217,705
March	52	205,674	59	245,363
February	55	231,213	47	195,156
January	51	229,516	55	246,266
December, 1929	57	292,419	62	302,713

New Orleans

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	210	589,459	218	605,239
August	220	600,786	241	666,625
July	270	697,526	245	653,562
June	233	606,340	239	626,307
May	260	686,543	251	662,383
April	226	712,630	261	701,159
March	255	703,361	263	699,493
February	263	715,681	237	630,673
January	252	706,945	260	715,903
December, 1929	273	772,310	279	785,160

Charleston

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	19	54,863	19	69,530
August	13	34,274	13	24,742
July	25	70,538	25	51,805
June	18	42,196	18	46,140
May	20	50,484	20	50,484
April	22	49,651	26	56,022
March	32	70,250	24	60,834
February	20	52,660	18	44,494
January	25	61,031	22	58,857
December, 1929	16	42,198	19	46,455

Galveston

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	46	117,185	119	337,091
August	37	82,429	97	277,077
July	40	93,999	83	249,064
June	28	60,622	63	171,223
May	35	59,807	82	240,137
April	26	39,332	66	183,706
March	24	31,987	82	235,656
February	26	48,200	68	197,140
January	30	77,176	87	274,299
December, 1929	27	65,306	104	358,823

Los Angeles

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	255	697,262	218	616,018
August, 1930	211	631,167	221	621,088
July	230	687,670	196	611,768
June	240	632,188	225	641,270
April	214	639,153	200	637,922
March	211	682,547	218	677,011
February	177	580,092	165	542,392
January	185	601,710	176	596,007
December	212	619,119	178	589,551
November	225	676,209	215	664,661
September, 1929	259	621,704	225	605,808

San Francisco

(Exclusive of Domestic)

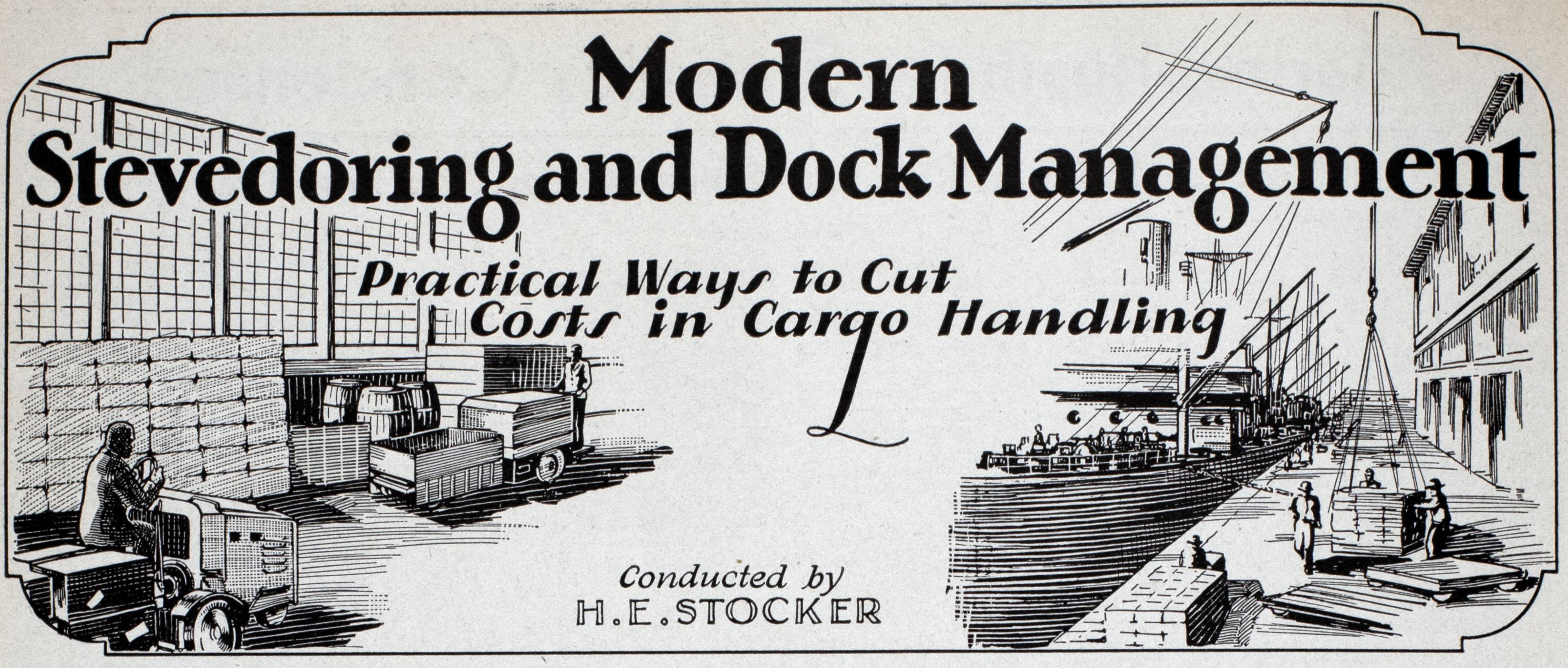
Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	171	699,832	154	629,577
August	164	670,748	159	653,208
July	166	674,380	166	676,092
June	154	652,411	134	560,605
May	168	709,182	156	625,712
April	161	555,903	156	569,368
March	179	710,763	150	631,782
February	142	565,514	135	567,268
January	158	644,015	149	630,336
December, 1929	182	632,677	148	558,136

Houston

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1930	32	140,415	62	220,024
August	39	147,462	69	257,365
July	30	120,727	42	158,570
June	47	190,145	45	193,620
May	41	146,840	47	172,171
April	38	139,147	57	206,182
March	33	130,108	43	162,519
February	37	149,161	60	226,761
January	28	99,518	43	148,219
December, 1929	39	152,270	62	232,090

Note: The figures given in this article are for direct entrances and clearances. Additional vessels in foreign trade enter and clear from and to other American ports after original entry and before final departure. At the port of Philadelphia, for instance, additional vessels in the foreign trade in this category were 66 of 220,897 net tons entered and 74 of 251,564 net tons cleared for the month of September.



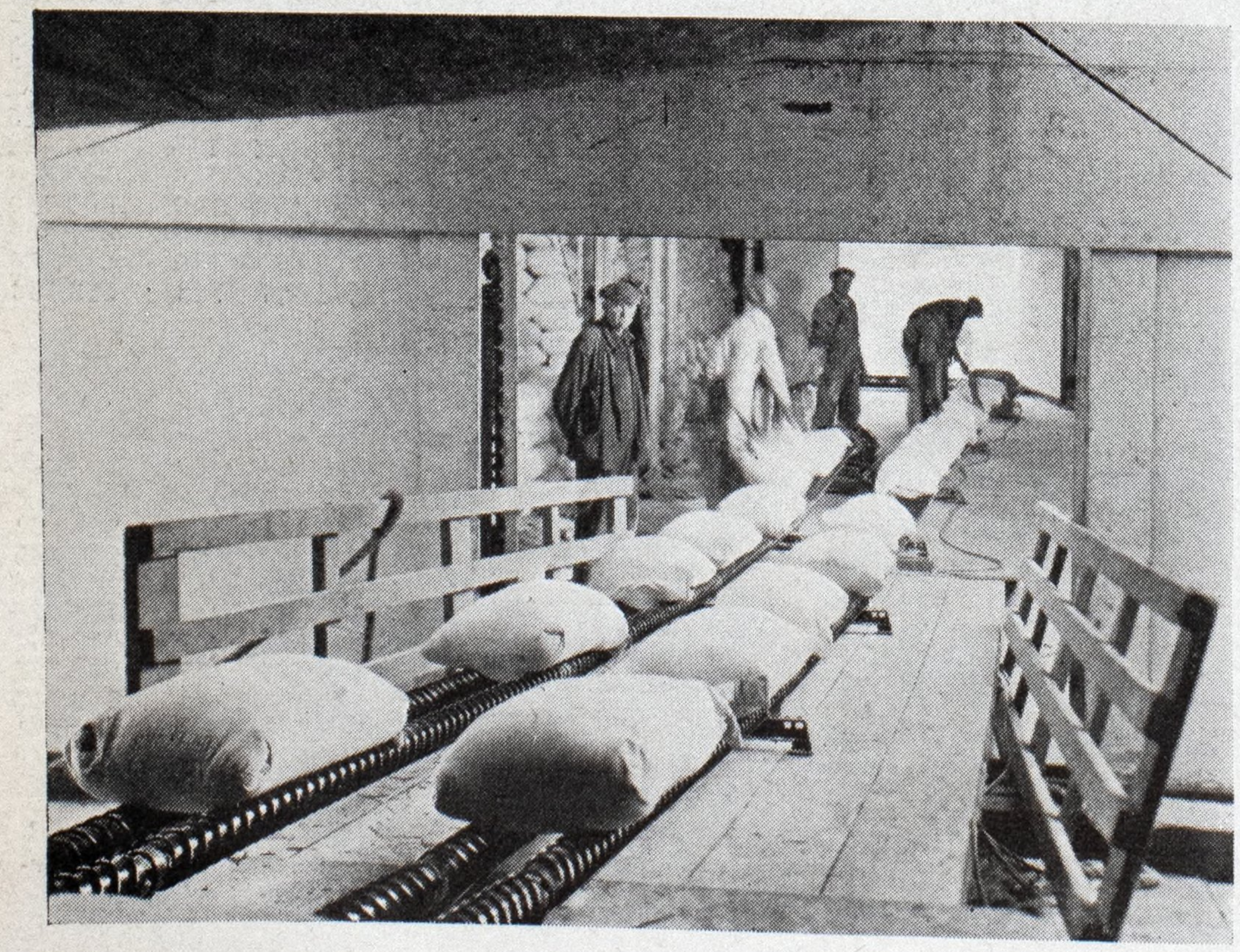
Mill Products Are Unloaded Quickly by Practical Use of Conveyors

By H. E. Stocker

THE problem of using conveyors for discharging cargoes of flour and other mill products with marks badly mixed in stowage, has been worked out by the Great Lakes Transit Corp., operating 19 freighters and 3 passenger ships on the Great Lakes, and the Conners Contracting Co., doing the stevedoring work at Buffalo. The Great Lakes Transit Corp. handles 1,000,000 tons of cargo a year, three-quarters of which is inbound.

The freighters arrive at Buffalo with 2500 to 5800 tons to be discharged and from 1000 to 1400 tons of general cargo to be loaded in less than 24 hours.

One boat arrived at 7:00 a. m., discharged 5000 tons of flour and other cargo by 6:00 p. m., then shifted to the westbound berth and loaded 1400 tons of general cargo by midnight. The handling of such a large quantity of cargo in such a short period of time without mechanical equipment would result in excessive labor costs. The job might be done but only by using a large number of men, so that the tons per man hour would be small. Handling the same character of cargo inbound at another terminal on the lakes where two-wheel hand trucks alone are used, the tons per man hour are only 1.10, but 260 men are required to discharge 2000 tons in 6¾ hours.



Screw conveyors unloading bags of flour from a vessel of the Great Lakes Transit Corp. at Buffalo. Arrangement of conveyors in 'Tween decks and on Gangway through Side Port of ship

The Conners Contracting Co. and the Great Lakes Transit Corp. have solved the problem of handling such a large quantity of cargo in such a short period of time by the use of the newly developed screw type of conveyor and the belt conveyors operated in conjunction with 1076 trailers and 13 tractors.

The screw type conveyor is portable and easily handled and so constructed that it meets conditions to be found on terminals and in ships. A conveyor for marine uses should be portable and easily handled, so that it can be set up and taken down economically, thus making it useful in handling comparatively small parcels of cargo. Easy portability requires light weight so that the conveyor may be moved, set up and taken down by man power alone. The couplings of the various sections are flexible so that as the ship rises and falls with the tide, or as it lightens or gets deeper, the conveyor will automatically adjust itself to the changing conditions. The conveyor is also constructed so that it may be used in small and congested places on the ship and on the terminal. The development of a conveyor meeting these needs was delayed because of the lack of understanding of the possibilities of conveyors by shipping men and the lack of the understanding of the limitations of conveyors by conveyor salesmen and engineers.

One company built a conveyor for a marine terminal that weighed seven

tons. It was so heavy and awkward to handle that it was utterly useless. Another steamship company spent about $8000 building a conveyor and discontinued its use because it was found uneconomical to use because of the class of cargo handled on the particular terminal for which it had been purchased. Another terminal of the same company could have used the conveyor profitably, but due to the lack of knowledge as to the use of conveyors, no one had thought of this possibility.

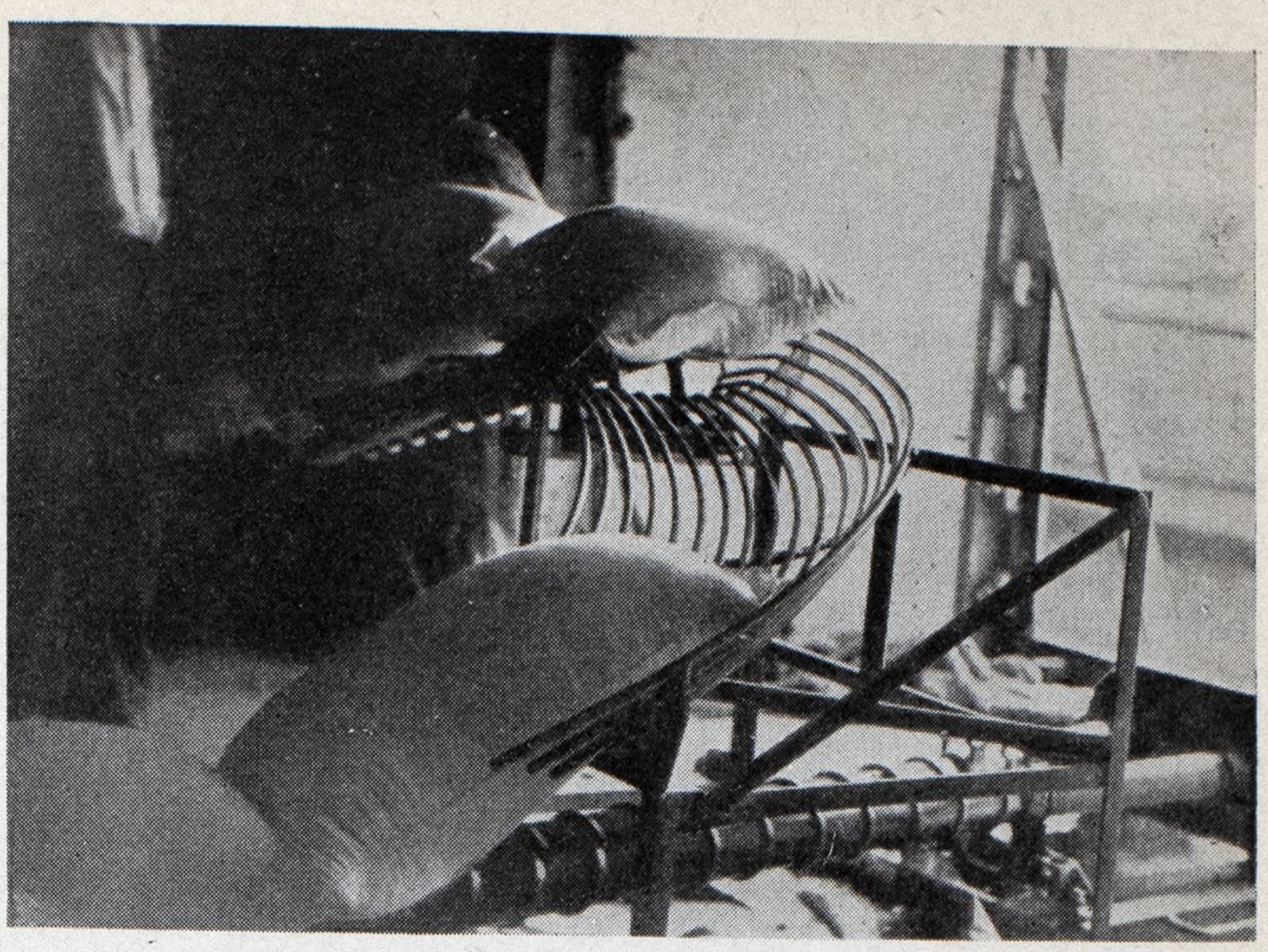
There are eight screw type conveyors in operation on the terminal of the Great Lakes Transit Corp. at Buffalo, that is, eight power heads and 104 sections, this number including the extra sections purchased for particular needs. The sections are composed of two spirals, welded around two eight-foot sections of tubing and are turned toward each other by an electric motor in the power head. A section weighs only 140 pounds. There are five of these eight-foot sections and one power head to a set. The power head weighs 365 pounds. Four-foot sections are also available for use under conditions requiring less distance. The eight-foot sections are connected by universal joints so that the conveyor may be deflected at a horizontal angle or ascending joint or for a deflection of 15 degrees at any descending angle.

Bags placed on the screws are pushed forward quickly and without damage to the bags. With an extension cord the conveyor may be set up and operated wherever electric current is available. The motion of the spirals does not damage the bags. Tests showed that a cotton bag filled with flour could travel 20,000 feet up an 8 per cent grade without damage. The conveyor was set up with hurdles over the power heads so that the bags were kept going constantly. Sugar bags, a cotton bag within a gunny bag, lasted for 26,450 feet on the same grade.

The Great Lakes Transit Corp. uses this screw type conveyor for taking sacks of flour and other mill stuff from the 'tweendeck to a belt conveyor suspended from the roof of the dock shed. The belt conveyor extends down the pier, one leg 280 feet in one direction and the other leg 250 feet in the opposite direction.

When a boat docks and gangways are cleared, the screw conveyor is set up in the tween deck. One trunk line conveyor is run across the ship from the side port on the opposite side from the dock to the gangplank and across the gang plank to the dock, where it discharges the bags on to a 36-inch belt conveyor which carries the bags up a steep grade to the belt conveyor running down the shed. Another trunk line conveyor is set up parallel with the first but the power head is set up approximately midship. This conveyor serves the section of the 'tweendeck nearest the dock. These trunk line conveyors are served by wing conveyors as required. These wing conveyors run fore and aft one on each side of the ship. It is in the wing conveyors that the four-foot sections of the screw conveyor are used. The bags from the wing conveyors are discharged to the trunk line conveyor by means of right-hand and left-hand chutes. The end of the wing conveyors are raised and attached to the steel frame of the chute which has been placed astride the trunk conveyor near the power head. The bags drop off the end of the conveyor, slide down and around the curved chute to the trunk conveyor. This arrangement is shown in one of the accompanying illustrations.

Conveyors in the Wings of the 'Tween deck delivering bags of flour to chutes for Transfer to screw conveyors running athwartships and out of side port to dock



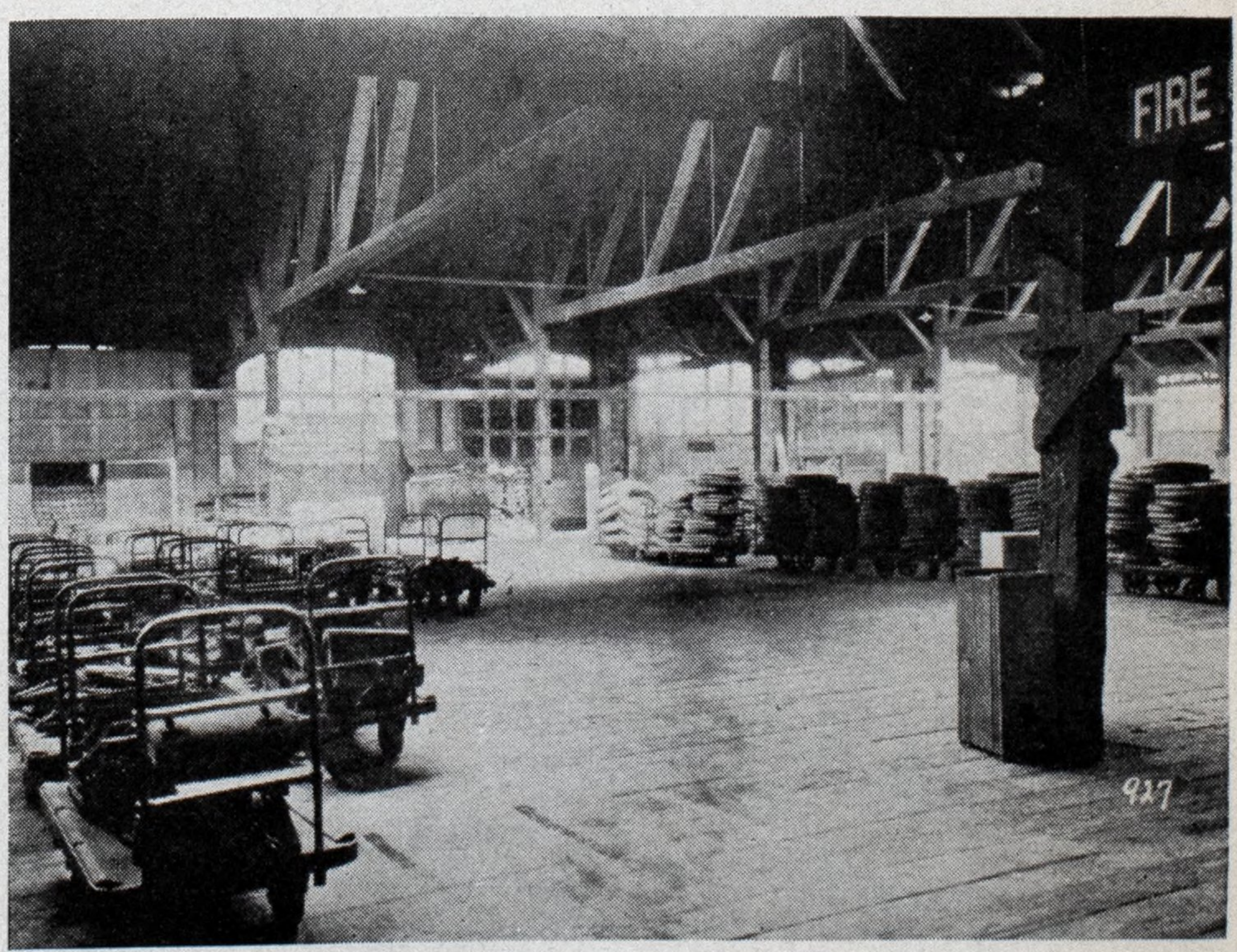
The author timed the bags handled by the two lines of conveyors running out of one port. Bags of flour were handled at the rate of 156 tons per hour, although the conveyor was not full at all times.

The belt conveyor upon which the screw conveyor feeds is speeded faster than the screw conveyor, so that the bags are properly spaced for the men on the sorting tables. These sorting tables take care of the problems of separating mixed marks. The conveyor running down the shed discharges upon a conveyor that brings the bags to a belt conveyor running the length of the sorting table. The table is made up of this belt and wooden aprons on each side of the belt. As the bags come along, 18 to 20 men stationed along the sorting table pick out the particular marks for which they are responsible and transfer the bags to trailers spotted nearby. Helpers pull the loaded trailers away from the table by hand and replace them with empties. The loaded trailers are made up into trains. These trains are hauled by gasoline and electric tractors to the cars spotted along the shore side of the dock. The trailer train is broken up and the trailers are taken into the cars by the car gangs and the bags are taken off the trailers and stowed.

Bags are kept on conveyors on trailers all the time they are on the dock except in rare cases when they are held in storage. This is a good application of the principle, "Keep the freight off the floor of the dock and the deck of the ship," discussed in the February, 1929, issue of MARINE REVIEW.

After the cargo has been cleared out of the 'tweendeck, hatches are opened and bags are hoisted in a canvas sling from the lower hold by means of a single fall operated by a line shaft running fore and aft on the starboard side of the ship. A slingload usually consists of eight bags. This load is landed alongside of the hatch. The

Westward cargo consists of a great variety of manufactured products — This cargo is classified and is held on Trailers ready for loading into ship



bags are then put on the screw type conveyor running from alongside the hatch to the trunk line conveyor running out of the side port. A four-foot and an eight-foot section makes the wing conveyor the right length for this operation. Bags that need coopering are sewed up at the hatch.

The bags are taken out of the hold at the rate of 105 tons per hour. This operation is slower than the 'tweendeck operation due to the limited discharging rate of the line shaft.

During the discharging the screw conveyor adjusts itself as the ship gets light. Because of its easy portability, a conveyor can be shifted from one port to another with little delay. Sections can be added or taken out easily because of the light weight of the sections and the ease with which couplings are connected or disconnected.

The best use of conveyors in the ships of the Great Lakes Transit Corp. is possible because the ships are side port ships. The above illustrations are of a vessel with six side ports on each side in addition to two doors on each side of a refrigerator compartment on deck. There are ten overall hatches. This gives a total of 26 cargo openings on this ship, exclusive of 'tweendeck hatches. This is a great contrast to the five cargo openings in the usual deep sea freighter and explains the handling of 6500 tons of cargo in 17 hours with only four hours' overtime.

At one time when the author was on this terminal, cargo was being discharged from six side ports, from a chute leading from the refrigerator house on deck and from another chute discharging shingles that were stowed on deck.

The management of the Great Lakes Transit Corp. have made large expenditures for mechanical equipment but they realize that money spent in this manner reduces costs, expedites ship's dispatch, and that these results and not initial cost are the ruling factor.

When the screw type conveyor was brought to the attention of the management the features that makes it so useful in a marine operation was quickly recognized. The first trial of this equipment on the terminal of the Great Lakes Corp. at Buffalo was made last June. The results have been so satisfactory that additional equipment has been ordered and more is contemplated.

New Terminal is Completed at Portland, Me.

THE Portland Terminal Co., a subsidiary of the Maine Central railroad has completed a new marine terminal at Portland, Me. This terminal replaces the old terminal which was destroyed by fire in September, 1929.

The wharf is 950 feet long. A shed has been constructed which is 122 feet and 7 inches wide and 792 feet long and is set back from the stringpiece 40 feet, providing space for two shipside tracks. The shed has 36 bays each which are 22 feet wide. The sections from the offshore wall of the shed to the monitor roof section and the section from the inshore side to the monitor section are each 32 feet wide. The section under the monitor roof is 58 feet and 7 inches wide. The height to the underside off the roof beams is 16 feet.

The wharf is of wooden construction. Piles of great length were brought from the Pacific coast, some of which are 110 feet in length. The shed is of all steel construction. The walls are of galvanized steel. Doors are of steel, spaced 22 feet.

The shed is fully equipped with a sprinkler system. There are 800 heads. Additional fire protection is provided by six plugs for fire hose.

Good Lighting is Provided

The lighting in the daytime and at night is exceptionally good. Windows run the full length of each side above the doors and a half of each door is a window. Additional light is provided by windows across each end of the shed and by windows on each side of the monitor roof. Lighting at night is provided by 132 two hundred watt lamps fitted with gas tight globes. A 1000-watt flood light is attached to each of the two eighty-foot masts that have been erected at each end of the wharf.

A line of plugs is provided along the inshore side of the shed so that lights may be run into cars when freight is being handled.

The floors of the shed are constructed of concrete for the section that is over land, while the section over water is 1 1/16-inch thick maple, over 2½-inch southern pine, a construction which gives an excellent trucking surface and wears very well. The floor between the stringpiece and the shed is constructed of 2½ by 8-inch pine planks.

One of the two shipside tracks is spaced 11 feet from the face of the wharf. The other track is 31 feet from the face of the wharf. This arrangement gives plenty of space along the stringpiece for operator cars to be loaded or unloaded directly from or to a ship. Another factor determining the spacing of the tracks was the desire to have locomotive cranes work cargo. This required sufficient space between the tracks so that the crane might have a full swing. Two depressed tracks are on the inshore side of the shed. The shed floor is 46 inches above the top of the rail.

Woodpulp is the principle cargo handled over the new terminal. In order to keep handling costs at a low figure and to expedite loading of cars, 20 storage battery chisel trucks have been purchased. These trucks have a chisel made up of three steel prongs. The overall width of the chisel is 22 inches. The length is 23½ inches. It may be elevated to a height of 60 inches. One man operating one of these trucks can pick up four to five bales of woodpulp weighing from 340 to 450 pounds each without the aid of a helper. The chisel is run under the lower bale and then the load is tilted and raised clear of the floor. These chisel trucks will be used also for piling bales of woodpulp seven high. The truck in performing this work will place four to five bales on the floor, then get two to three bales and place them on top of the others.

The chisel trucks will also be used to handle china clay in bulk which is brought into Portland by schooners from Georgia and by ships from

In equipping the Terminal at Portland Me. special attention was given to mechanical equipment for cargo handling—Chisel Truck Handling bales of Wood Pulp

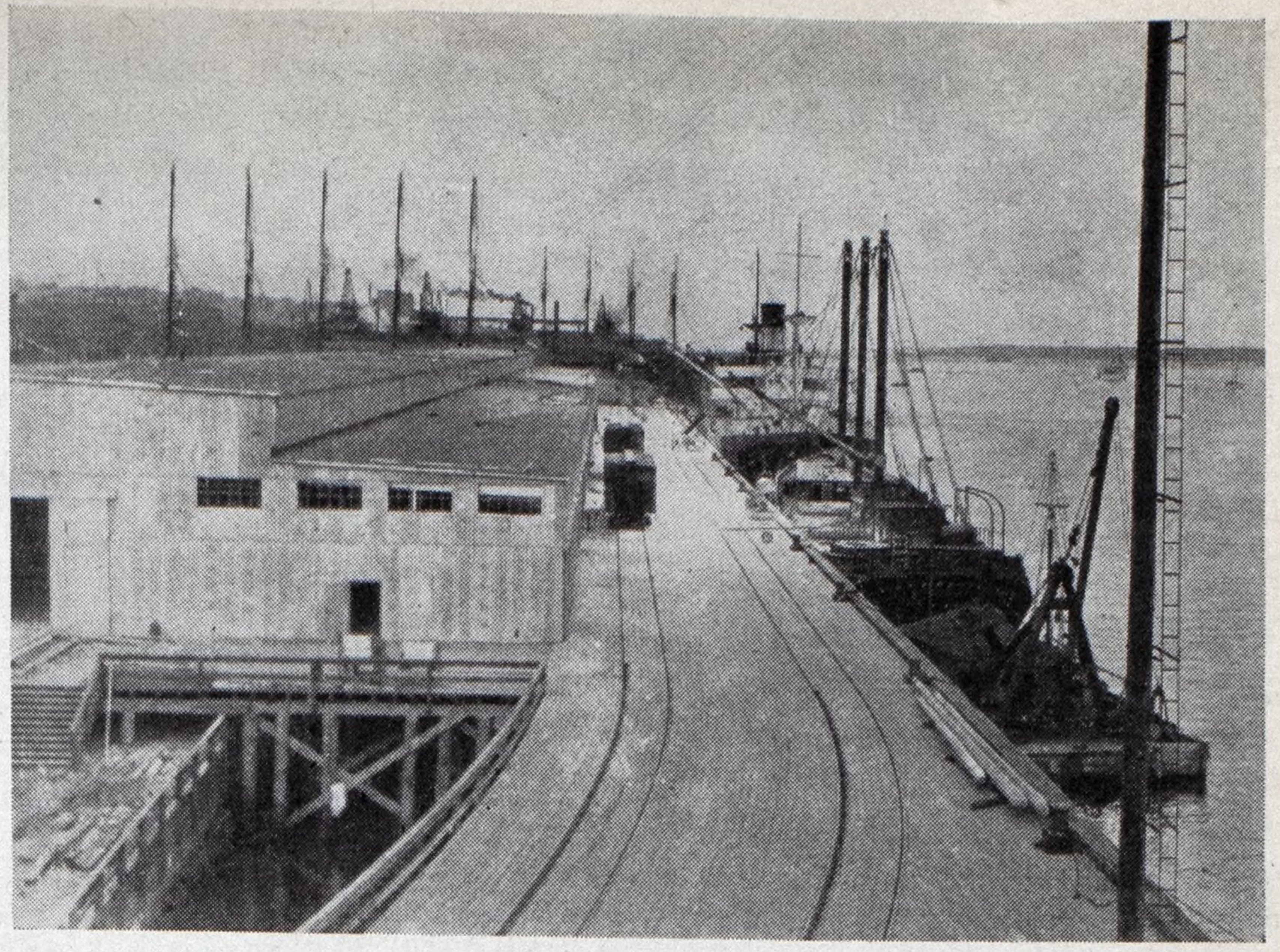
England. The trucks will be fitted with dump buckets for handling this commodity. These will be filled from hoppers. The truck will then take the load into box cars and dump the clay. The small overall turning radius of the truck is an important factor in this operation.

Vichy steel aprons will be used to bridge the space between the shed floor and the car floor.

Service to ships at the terminal is improved by putting in eight telephone plugs along the stringpiece so that ships officers may have direct telephone connections with the shore. Local calls will be free.

The wharf was constructed by the Merritt, Chapman and Scott Corp., under the direction of Asa H. Morrill, chief engineer of the terminal company. J. B. Trumbull acted as resident engineer and Fay, Spofford & Thorndyke, of Boston, as consulting engineers.

A new coal handling terminal has also been completed and a terminal for handling pulpwood, lumber and china clay is now under construction. These two terminals will be described in a future issue of the MARINE REVIEW.



New Terminal at Portland Me. Recently completed to replace old terminal destroyed by fire September 1929. Operated by the Portland Terminal Co. a subsidiary of the Maine Central Railroad

Side Ports and Trucks Are Used by Matson Line

THERE is an increasing interest in side ports for handling cargo into and out of deep sea ships. This article tells about the use of side ports at San Francisco by the Matson Navigation Co. which operates between Pacific coast ports and the Hawaiian Islands.

The Matson line operates 23 ships in the Hawaiian trade, the largest being the well known MALOLO of 17,232 gross tons. Another well known ship of the fleet is the MAUI, of 9801 gross tons, which served in the transport service during the war.

The cargo handled outward from San Francisco consists of general cargo. The inward cargo consists largely of canned pineapple.

The number of side ports to a ship varies with the ship. The freight and passenger ships have five side ports on each side. They have four cargo holds with four ports into the tweendecks and one port into the shelter deck. These ships are of the type usual to Matson, i.e., engines and boilers aft. The largest freighters of the fleet have 24 side ports, 6 on each side into the shelter decks and 6 on each side into the tweendeck.

The new ships being built at the Fore River plant of the Bethlehem Shipbuilding Corp. for the Australian trade will have side ports.

The doors on all ports open out. This is better than having the doors open in because cargo space is not wasted by leaving the space necessary for the swing of the doors. The large side ports have sliding doors. These hang on a traveler and slide along the side of the ship. The smaller ports have hinged doors.

The standard size of ports is 6½ by 6½ feet but the company is now constructing larger ports in the new ships for the Australian trade.

At San Francisco the side ports in the Matson ships are utilized to the best advantage by the operation of a fleet of 72 electric trucks. The first 6 trucks were purchased in 1915. These were of the lift truck type. The fleet was added to from time to time until the present number was reached. The 72 trucks are made up of 26 lift trucks and 46 non lift platform trucks of 4000 pounds capacity, and one crane truck used for maintenance.

The lift trucks operate with a fleet of about 400 dead skids and 25 live skid platforms. Cargo is received directly on to skids to a large extent from motor trucks and railroad cars. Small shipments of package freight are received direct to skids at a door at the bulkhead. This keeps trucks with small shipments off the piers and reduces handling costs.

The load carrying trucks are used principally for discharging cases of canned pineapple because the large number of marks, sometimes over a thousand marks in a cargo, necessitates running the truck from pile to pile to separate the marks.

In loading ships and in loading freight cars, the lift trucks and skid platforms are used. The trucks run directly into the ship and cars in handling freight overall. The skids are hoisted into the ship with slingload or specially constructed gear. Large quantities of cargo are trucked into the tweendeck or shelter deck with the storage battery truck and sent to the lower hold by chutes.

The port of Oshawa, Ont., was officially opened on Aug. 7 when, according to the old Canadian tradition, the authorities of the port presented the captain of the vessel CITY OF KINGSTON with a silk hat. This port has about 300 feet of modern concrete wharf inside the harbor and has applications on file for 1200 feet of wharfage from different shippers which at the present time is unable to supply.

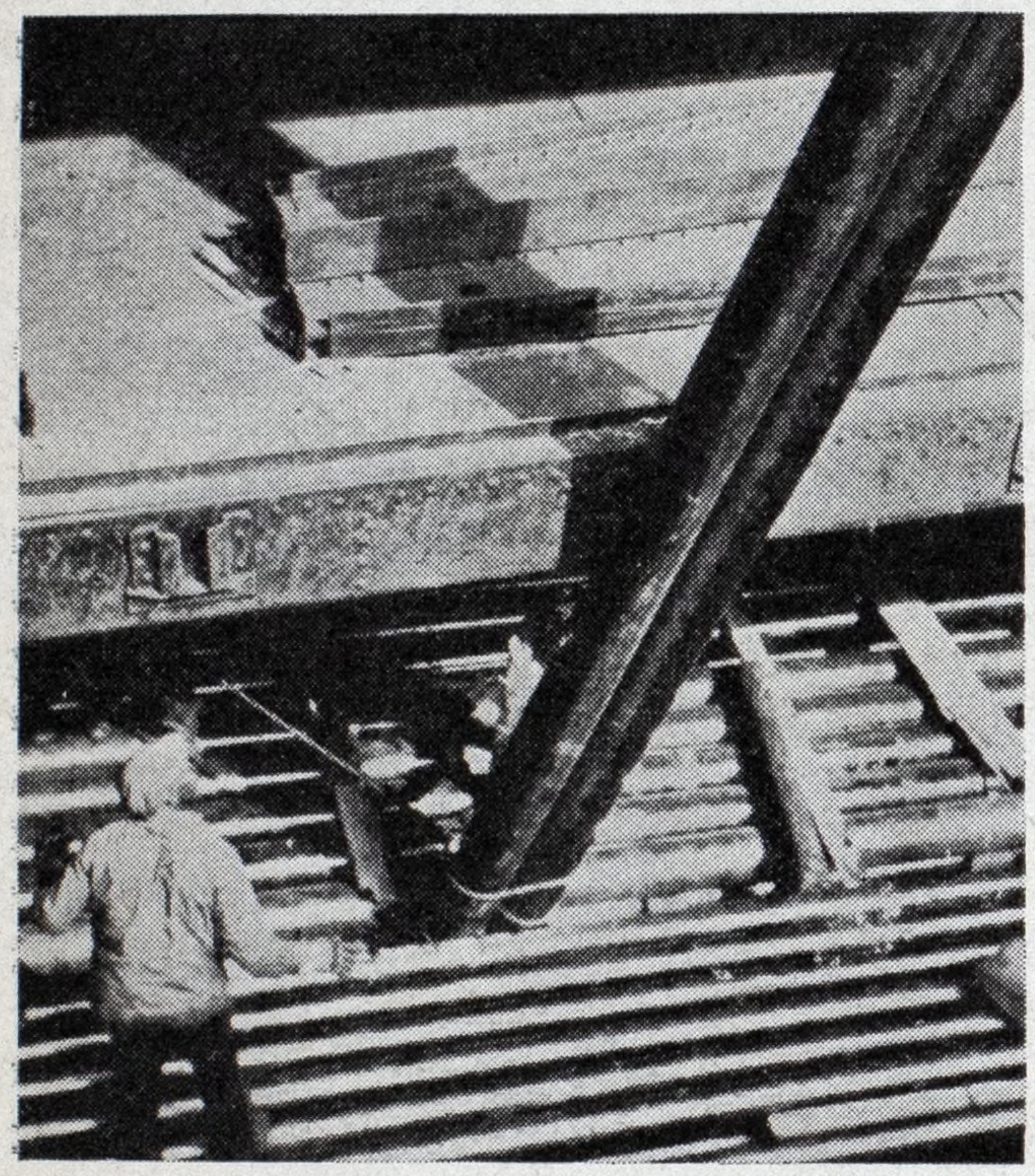
One of the Matson Navigation Co's Piers at San Francisco. Electric Lift Truck handling skid with load of Sugar

Useful Hints on Cargo Handling

THIS page is to be devoted to short items on all matters having to do with the more efficient turn-around of ships. These items are intended to be of a helpful nature.

We will welcome for this page brief descriptions, illustrated if possible, of any better or safer way of performing any function in cargo handling. Also, any questions submitted will be answered by the editor.

CLAIMS have been made for damage to cargo by taint from the odor of green lumber, shingles, cedar logs, chemicals, etc. Cargoes susceptible to damage from such causes as for instance, flour, rice, coffee and tea, should under no circumstanecs be stowed in the same hold. The odor of lumber cannot be confined to the lower hold, because scuppers have to be left open and the odor will pass along such scuppers and permeate the 'tween decks. It is worth while remarking that most fertilizers contain ammonia. Damage is readily caused by the emission of ammonia fumes, and foodstuffs must under no circumstances be stowed



Care Must be Taken to Avoid Accidents in Handling this Cargo

together with fertilizers. Ammonia fumes are also corrosive and may damage canned goods.

Certain cargo as for instance, chloride of lime, aniline oil and rubber tires (in the manufacture of which aniline oil or derivitives thereof have been used) give off aniline fumes or chloride gases which are discoloring and poisonous. Chlorine gases are also corrosive and while both will cause serious damage to all kinds of dry goods and manufactured cellulose, chloride gasses will also damage ironware. Sulphur is used in the manufacture of tires, which may cause nickelware to tarnish. The aniline oil fumes given off by new tires will disappear when the tires become old and the risk of damage will disappear. Tires are liable to damage by oil and the fumes arising from paint manufactured from volatile oils, such as naphtha.

There have been instances where aniline fumes from tires carried on the westbound voyage have damaged goods on the next voyage, although the ship has been discharged and remained empty and well ventilated for 14 days. This indicates that the dunnage used for tires must not be used again for cargo which may be damaged by discoloration.

Steel or Wooden Hatches

THE following from the *Liverpool Journal of Commerce* is another good set of facts showing the advisability of steel hatch covers. A correspondent writes:

"I am not acquainted with your correspondent, but before he writes any more I would suggest that he gain some practical experience for himself in handling wooden hatches. He might quite well sign on a Cardiff tramp and go out across the bay in winter time, see huge seas breaking on the ship fore and aft, and feel her shake and quiver as she takes it green over the weather rail and know the fear of the seamen who wonder will the hatches stand. All the lashings in the world, whether rope, wire or chain, and set up with Warwick screws, won't make wooden hatches any stronger, and if made any heavier than they are nowadays they will be impossible to handle."

A Master Mariner.

Sweeper With Special Sprinkler Attachment for Cleaning Large Terminal

Steel should not be stowed close to green oak lumber. Acetic acid gas is given off by the lumber, causing rusting of the steel cargo

A light net may be thrown over a skid loaded with cases and then tied tight to the load to keep cases from falling off the skid when being moved about the dock.

Do Not Abuse Wire Rope

HERE are some points on the use of wire rope:

1. Sheaves which are too small for proper operation develop grooves

Light Net Used to Keep Cases on Skid When Being Moved

cut by the rope and the rope wears out quicker than if proper sized sheaves are used. The stress set up in a wire rope by the sharp bend over a small sheave is often as much or greater than the stress set up by the load itself.

2. Correct lubrication is important. There are a great many frictional surfaces due to the numerous small wires which rub against each other. Friction causes wear if proper lubrication is not provided. Lubrication used must never include acid. Employ a lubricant manufactured specifically for wire rope. Lubrication of running ropes should begin when the rope is placed in service and continued at regular intervals.

3. The American Marine Standards committee of the department of commerce has issued a circular giving general specifications for standard wire ropes for marine uses. This pamphlet may be obtained for 10 cents from the superintendent of documents, Washington.

Is Honored by Associates for Record of Service

WILLIAM H. RAAB, known in all maritime circles the world over celebrated his seventieth birthday on Oct. 15 as the guest of honor at a luncheon given by his associates of the Todd Shipyards Corp., with whom he has been actively connected for the past 23 years. During the luncheon a platinum watch and chain was presented to Mr. Raab by John D. Reilly, vice president of the Todd Shipyards Corp., the inscription on the watch reading "1860-1930 Presented to William H. Raab on his seventieth birthday by his associates, New York office of the Todd Shipyards Corp., Oct. 15, 1930." Complimentary speeches were made by Mr. Reilly, William A. Maloney and other officials of the Todd company.

Mr. Raab was born in London Oct. 15, 1860. At the age of 17 he went to sea as engineer's messboy in the employ of the General Steam Navigation Co., running out of London. After three years he joined the Red Star line as an oiler and in a short time was promoted to junior engineer on the steamer WAESLAND. In 1887 he left the Red Star line to join the Morse Iron Works in Brooklyn. Mr. Raab was soon made superintendent of the Morse plant and continued in that capacity until 1902, when he left to enter business for himself, organizing the Raab Iron Works which he sold in 1907 to go with the Robins Dry Dock Co.

Wm. H. Raab

In 1916 the Robins Dry Dock Co. became a subsidiary of the Todd Shipyards Corp. and Mr. Raab was put in charge of the soliciting department at 25 Broadway, New York. In 1925 he relinquished his more strenuous duties as solicitor-general but still acts in an advisory capacity.

Merchant Fleet Corporation Gives Quarterly Report

During the past quarter the Merchant Fleet Corp. consummated the lump sum agreement and effected certain rearrangements covering: Texas Star line, Mississippi Valley line, Southern States line, American Republics line, Texas U. K. line, Dixie U. K. line.

No operating company was eliminated in the rearrangement. When the allocation of the Texas and Dixie Mediterranean lines is made, all shipping board lines will then have been placed under the lump sum agreement, with the exception of three lines pending sale; namely, American Diamond, America-France, and the Gulf Orient.

Incidentally a recently prepared estimate of a year's operation of five lines under the lump sum agreement compared with the same period of operations under the M. O. 4 agreement indicates a saving to the fleet corporation of two million dollars per year on these five lines.

On July 16, 1930, the Mobile Oceanic line was sold to the operator.

The American Brazil line was sold to Philadelphia interests under the usual guarantee for service, as approved by the board, the operator not presenting any offer for this line.

The sale of the American Hampton Roads line to the operator at private sale was consummated, Sept. 26, 1930. This line was the first to operate under the lump sum agreement, and the reports indicate that it has had a very satisfactory experience over the year's operation.

A sale was consummated of the mortgage on the TWIN CITIES and TWIN PORTS, payments on which were in default, whereby the board receives the amount of the mortgage in full.

A general order issued Sept. 24 covering reorganization of the home and field offices will reduce the administrative expense of the fleet corporation over one million dollars. This new arrangement and general liquidation is made possible by the inauguration of the lump sum agreement which shifts the responsibility to the operator.

Repair costs during this quarter, compared to the similar quarter of last year, show a reduction of over $200,000 per month, even taking into consideration that during this quarter 16 vessels were taken out of layup for active operation, and there were transferred over 50 vessels from the operating agreement, 1924, to the operating agreement 1930.

At the beginning of the quarter the corporation had on hand stocks of a value of approximately two and a half million dollars. A sweeping program has been instigated to dispose of these materials, and plans have just been completed to sell materials valued at approximately one million dollars in the next 90 days, chiefly to operators who may desire to purchase for vessels which are operated under lump sum agreement; and failing in this, the material to be offered for public sale. Bids have been received covering some of this material, having a book value of $500,000.

A new policy for insuring vessels sold for guaranteed service was recommended and approved by the board in September. This new schedule permits of a larger portion of insurance on these vessels which were sold for restricted service to be carried in the shipping board fund.

Well Known Shipping Man Dies of Heart Attack

FRED B. WEBSTER, well known in shipping circles both on the east and west coasts, died on Oct. 12 at his home, 1346 Bergen street, Brooklyn, N. Y., after a heart attack. He was a native of Augusta, Me., and was 52 years old.

As a naval architect and marine engineer and a man who had sailed the seas in various capacities, Mr. Webster was highly regarded and his advice and services were in wide demand. He had an exceptionally wide friendship in marine circles.

After graduating from Massachusetts Institute of Technology he engaged in engineering work for the United States navy and served for many years in the bureau of construction and repair. He also served in an engineering capacity on hull construction in the Moran shipyard at Seattle. He was a staunch supporter of the upbuilding of an adequate American merchant marine and navy. Mr. Webster initiated and for several years was engaged in the compilation of the Shipbuilding Encyclopedia published by the Simmons-Boardman Publishing Co., a unique volume highly regarded by engineers and considered a valuable contribution to the ship-building industry. It is a treatise designed to present the basic reference requirements of shipbuilding in such a simple form that they can be quickly and readily used in the practical designing of ships.

Fred B. Webster

Later he was editor of *Marine Engineering and Shipping Age* and was also for a number of years associated with the *Marine Journal* as advertising manager. At the time of his death he was handling advertising for *Marine Age* and the New Jersey Asbestos Co.

Mr. Webster was a member of the shipping board fuel conservation committee, the New York Maritime Exchange and the Propeller Club of New York. He was also for years a member of the Society of Naval Architects and Marine Engineers. He is survived by his wife, three daughters, two sons.

The Kerr Steamship Co. recently moved into its new home "Silver House," corner Pearl and Moore streets, New York. The building takes its name from the company's Silver line which recently added seven new motorships to its around-the-world service. Effective Jan. 1, 1931, the Silver line will be combined with the Java-Pacific line.

Diesel Electric Tugs Begin Service in Boston Harbor

MOVING ahead with the times is evident in the new diesel electric towboats LUNA and VENUS, recently completed for the Mystic Steamship Co. for service around Boston harbor. Sound progress in engineering pays in every way and gives lasting satisfaction to the owner, the builder and the operator.

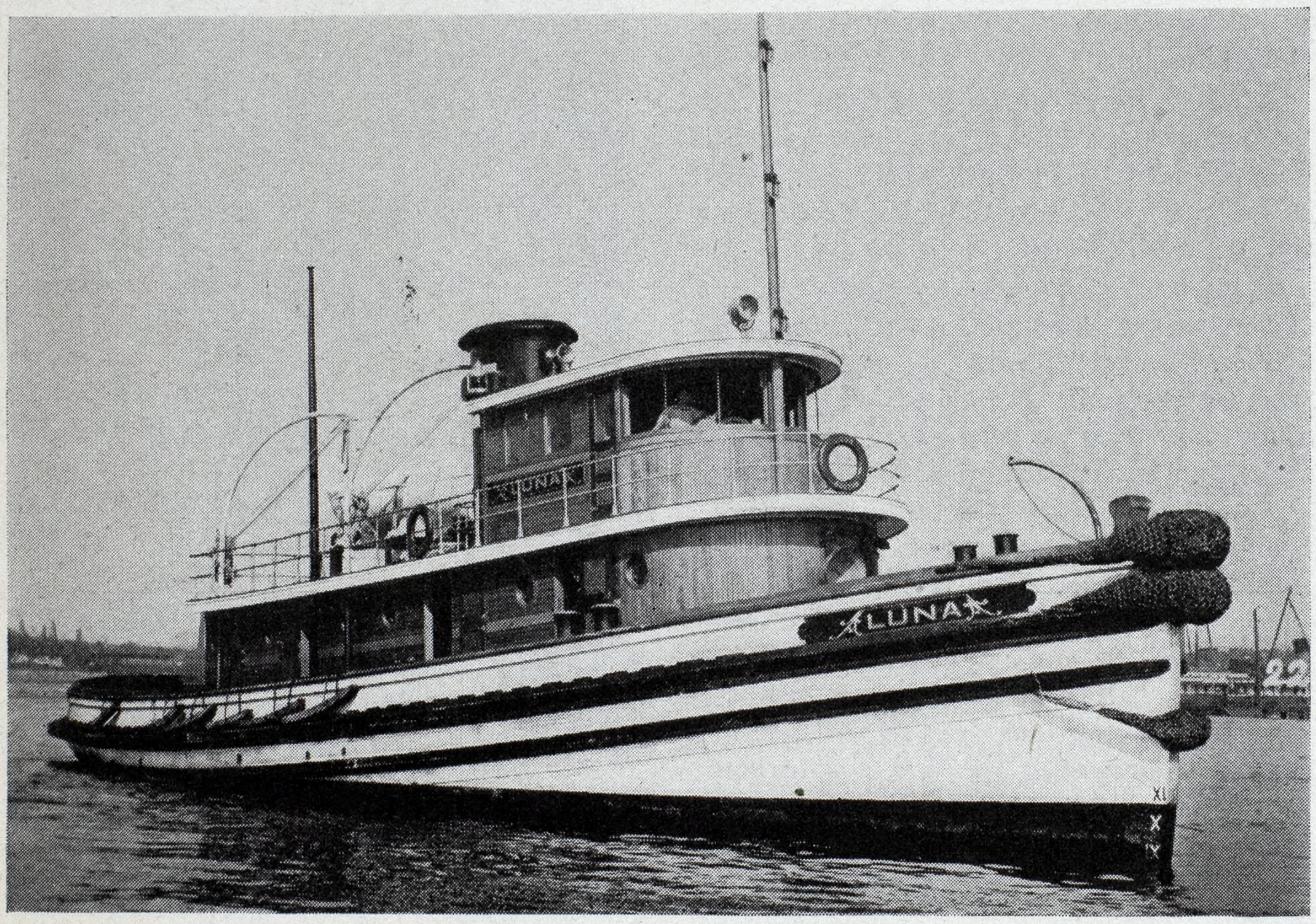
These tugs are single screw, the propeller being direct connected to one 515-horsepower, direct current, double armature, General Electric motor. Current for the motor is generated by two generators each of 213 kilowatts and with 25-kilowatt exciters, driven by direct connected Winton diesel engines of 12½-inch diameter cylinders, 16-inch stroke and 355 brake horsepower each at 300 revolutions per minute.

Both vessels are of substantial wooden hull construction. The LUNA was built by M. M. Davis & Son, Solomons, Md. She was launched July 29, and completed Oct. 18. The VENUS was built by Wm. G. Abbott Shipbuilding Co., Milford, Del., and was launched Aug. 16. As this is written delivery was expected Oct. 31. John G. Alden, Boston naval architect, served as consultant with representatives of the owner in working out the design. Classification is in the American bureau. Length overall is 96 feet; breadth molded, 24 feet; depth molded, 13 feet 6 inches; draft, 11 feet 6 inches; displacement loaded, 335 tons and the net tonnage is 112 tons. Bunker fuel capacity in diesel engine fuel oil is 21 tons or sufficient for three weeks steaming radius.

All machinery and equipment for both tugs were installed by the Atlantic Works plant of the Bethlehem Shipbuilding Corp., at East Boston, Mass., under the general direction of G. H. Stebbins, general manager.

An interesting modern feature of these tugs is the stern bearing which, instead of being the customary lignumvitae lined bronze sleeve, is of Cutless rubber type furnished by the Goodrich Rubber Co.

All of the auxiliaries are electric driven. Among the auxiliaries are, an electro-hydraulic steering gear made by the American Engineering Co.; General Electric refrigerator; American Radiator Co. oil fired heating boiler; CO_2 fire extinguishing equipment of the Lux system; Sperry searchlights; and electric telegraphs by Charles J. Henschel Co. Inc.



Diesel Electric Tug Luna Recently Completed for the Mystic Steamship Co., Boston

To prevent as far as possible any possible danger of breakdown, an unusually high capacity storage battery is floated on the bus. The batteries are of the Exide ironclad type, 56 cells of MVA 11. All of the vital auxiliaries are assured against loss of current. Should one of the main engines supplying this power stop suddenly, the steering gear, circulating water pumps, lubricating oil pumps, lights and field excitation for the main electrical machinery are automatically taken over by the battery. In addition to these auxiliaries which are attached to the battery bus at all times, if it is necessary, the following equipment can also be so operated: Engine telegraph, two motor driven air compressors, fire and bilge pumps, fuel transfer pump, sanitary pumps, electric refrigerator and searchlight. The battery is ordinarily floated on a bus supplied from one of the exciters. If the battery is used recharging can be done by increasing the exciter voltage of one unit allowing the other unit to carry the ship load.

It is safe to say that these two new tugboats represent, in the highest degree; modern marine engineering. The hulls are strongly built and the dimensions are the largest practicable for convenient use in Boston harbor.

There are several attractive features about electric drive for this service. The diesel engines driving the generators may run at their most favorable speed and always in one direction, while at the same time the propeller may be operated at its most effective speed. Maneuverability could not be higher. The captain on the bridge is in instant control of the speed and direction of rotation of the propeller. This control is as automatic as pressing a button to turn on the light. The engineer is not required to stand by for signals which leaves him free for other duties. With electric drive full power at the propeller under full load is immediately available.

The captain has at his disposal eight speeds ahead and eight speeds in reverse. The propeller is large and slow turning, giving maximum efficency. The rudder is of the balanced type which improves turning qualities. Beginning with machinery cold it is said to be possible to get away in five minutes. Included with other special equipment is an automatic telltale instrument which instantly indicates by buzzer and light in the pilothouse when any running or towing light burns out. All such lights are fitted with double bulbs so that either one may be used in case of failure of the other.

Facts and figures in this description and the photograph of the LUNA were furnished through the courtesy of F. B. Craven, manager of the marine department of the Mystic Steamship Co.

Navy Day is Observed

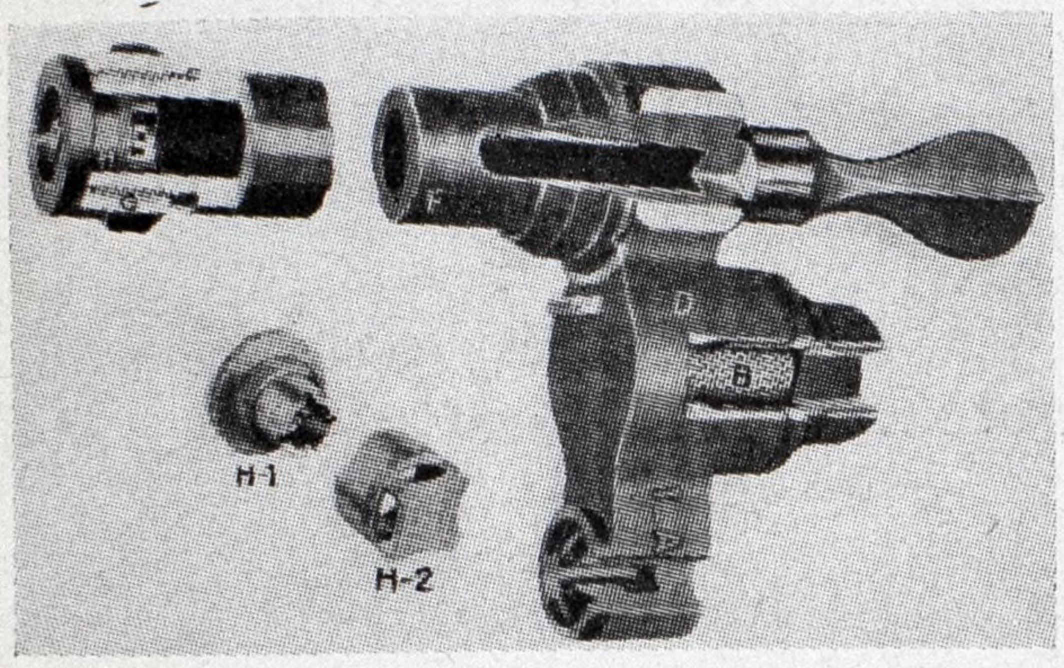
October 27, the anniversary of the birth of Theodore Roosevelt, strong supporter of an adequate American navy, has for years been set aside as Navy Day. On that day the attention of people all over the country is drawn to exhibitions of our naval power. It is well that everyone be made to understand the extent to which the United States is already a great naval power and the need of continued power on the sea equal to that of any other nation.

The real sea strength of a nation consists of its naval and merchant vessels. The navy is aware of its great dependence upon the merchant marine and realizes that the two are one as an instrument of national defense.

Equipment Used Afloat and Ashore

New Oil Burner for Marine Use—Electric Drive in Cargo Trucks—Wide Operating Range in New Pulverizing Unit

A NEW oil burner for use under marine boilers has recently been introduced by the Coen Co. Inc. This new device shown in an accompanying illustration is non-adjustable and is fitted with a new compound tip. Extreme simplicity features this new burner. The burner stem, spring and stuffing box have been eliminated in this improved model which is called Type B. It consists of the modified burner head D and tube of barrel F, cap G and



New marine type oil burner

new compound tip H. This new tip is composed of two parts, H-1 and H-2 shown in the illustration. H-1 contains both the outlet orifice and the atomizing chamber. H-2 is a thimble for the atomizing chamber. Both parts are made of steel, hardened to minimize wear. A very fine degree of atomization even at low pressure is said to be produced by the new tip, with its double diameter atomizing chamber and tangents set well back from the orifice outlet.

Electric Drive in Two New Cargo Handling Trucks

The rapidly increasing popularity of the electric lift truck-skid system of cargo handling is reflected in the wider range of truck types and sizes developed to meet operating conditions.

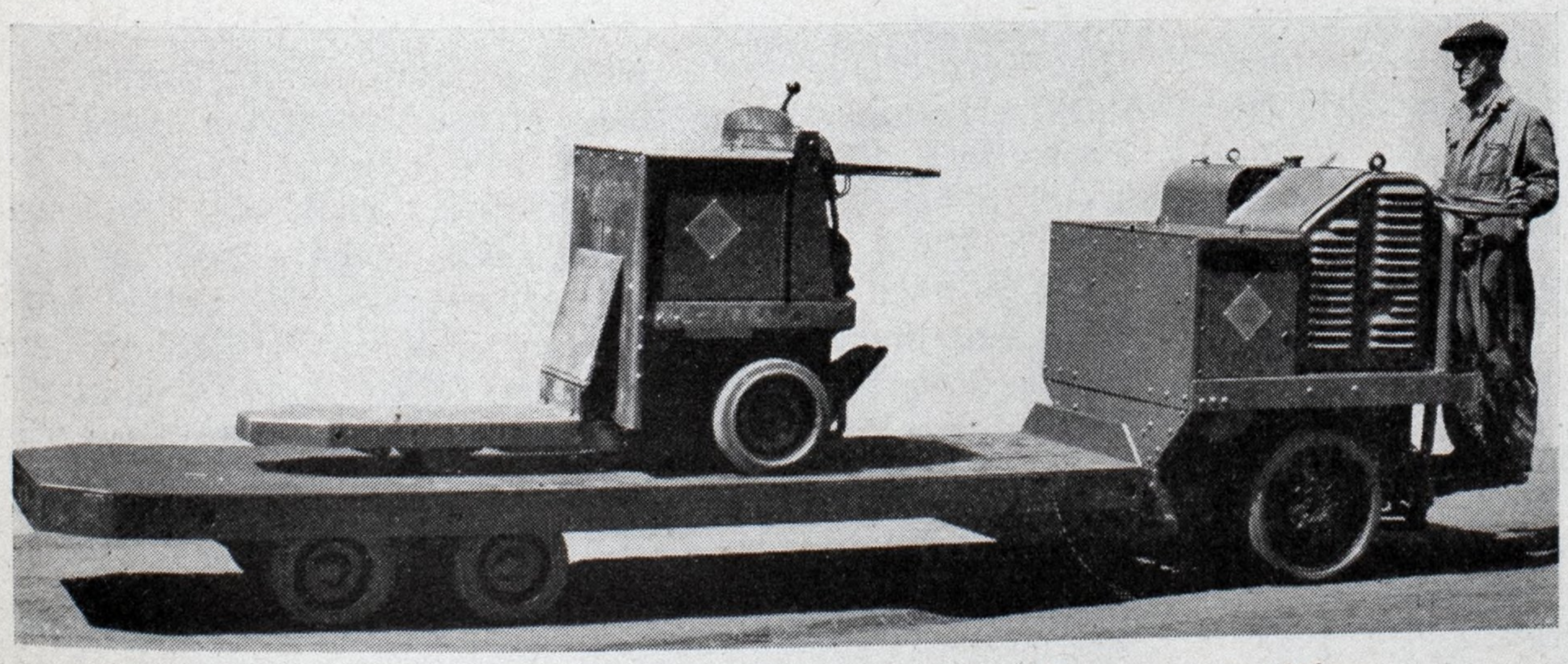
Shown in the accompanying illustration are two new sizes of electric lift trucks recently added to the line built by the Elwell-Parker Electric Co. Cleveland.

The big truck has a rated capacity of 10 tons. Lift platform measures 44 inches x 144 inches and stands 18 inches from the floor. The smaller truck, developed to handle hand lift truck skids is rated at 1¾ tons. Platform dimensions are 18 inches x 41 inches with a 7 inch clearance. Drop forged part are employed throughout the two machines.

All controls on both trucks are immediately in front of the operator for his convenience and safety while the two pedals upon which he stands are fitted with special deep rubber pads for his comfort and protection against back fatigue.

To elevate a 3500-pound or a 20,000-pound load, it is only necessary to close an electric switch. This switch automatically trips when the platform reaches its maximum height or it may be tripped manually at any point to arrest the upward movement.

The truck may be driven forward as soon as the load skids is off the floor for the separate lift motor will continue to elevate the load in transit and stop when platform reaches the upper limit.



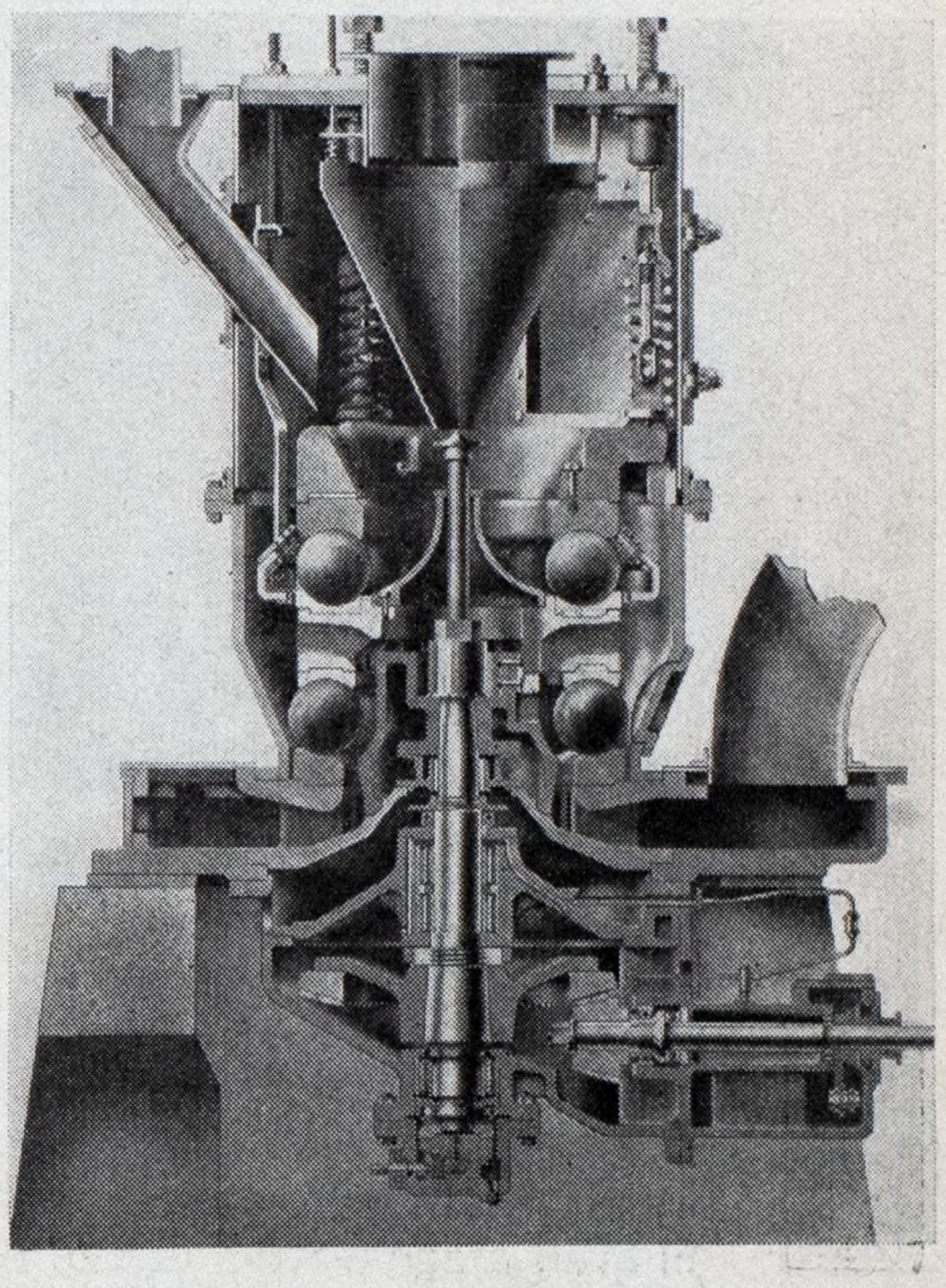
Two new electric lift trucks in 1¾ and 10 ton capacities

Wide Operating Range in New Pulverizing Unit

Progress made during the past few years in burning pulverized coal has greatly amplified the need of efficient pulverizers. To meet this need the Fuller Lehigh Co. Fullerton, Pa., has recently placed on the market a new type pulverizer.

This unit consists essentially of a top or separator section, an intermediate or pulverizing section and a base or drive section.

The top section is of heavy steel plate and cast iron construction and contains the classifying cone, coal spout and the mechanism for adjusting the grinding pressure. The intermediate section is of heavy section cast iron with carefully machined



New type coal pulverizer

flanges to which are fastened the top and base sections. The grinding elements, coal basket and driving yoke are mounted in the intermediate section.

The base or drive section is also of heavy section cast iron and provides a very rigid support for the mill. This section encloses the air distributing chamber, main and thrust bearings, drive shafts and gears and the force-feed oiling system.

The grinding elements consist essentially of two rows of large diameter balls, two stationary and one rotating grinding rings. The rows of balls —one row mounted above the other— are separated and propelled by the rotating ring which is driven by and floats on the main driving shaft. Both the stationary and rotating grinding rings are made to gage in order to insure interchangeability. Grinding pressure between the balls and rings is applied and kept uniform by externally controlled steel springs mounted in the top section.

The main driving shaft is supported by a self-aligning heavy duty thrust bearing. No thrust or hammering, re-

(Continued on Page 96)

Personal Sketches of Marine Men

Kermit Roosevelt, President, Roosevelt Steamship Co.

By Ben K. Price

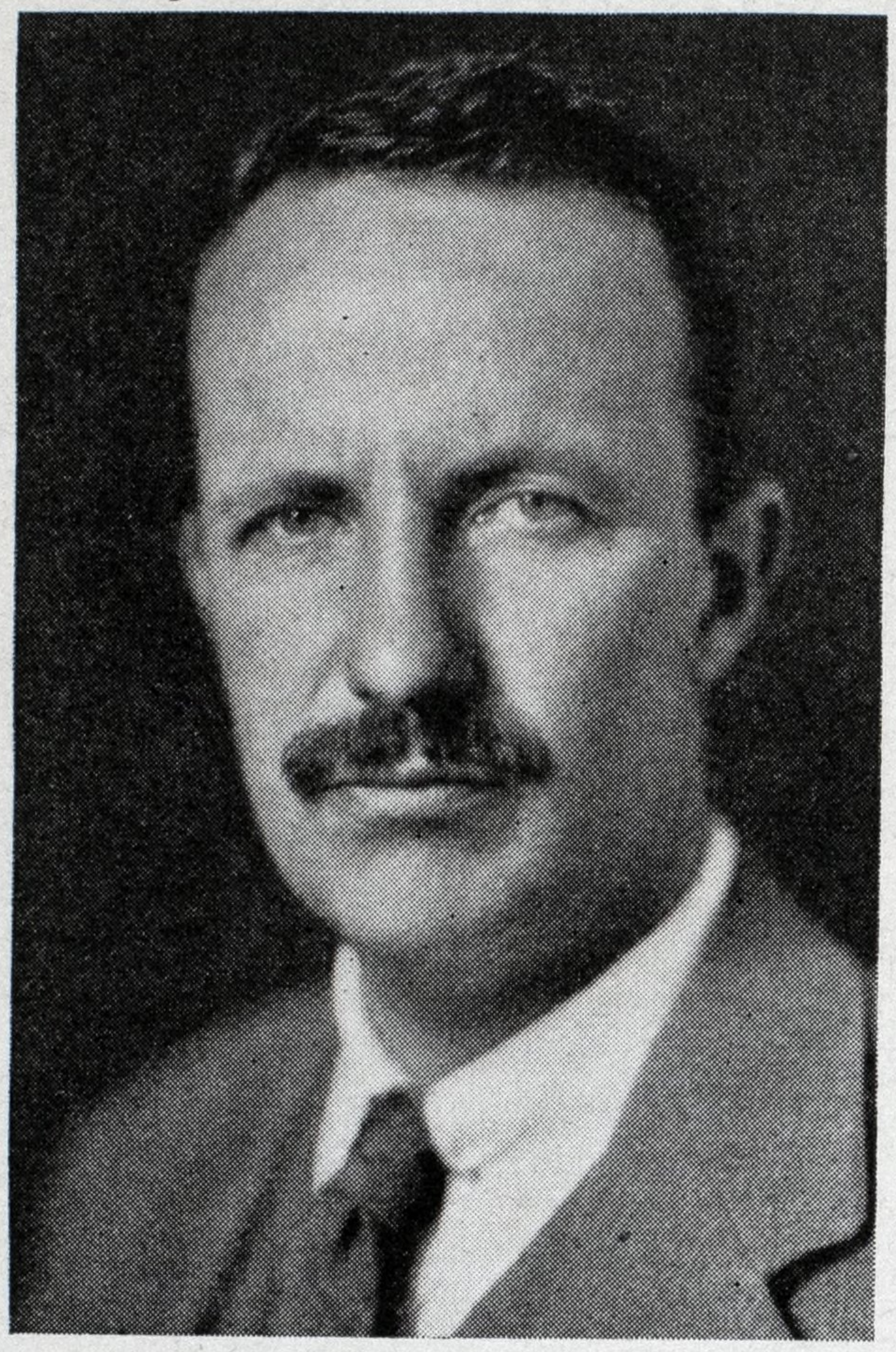


Photo by Blank & Stoller

ONE of his outstanding characteristics has been loyalty, through some difficult pioneering, to the work of his selection.

HE HAS, therefore, entirely on his own merits, earned a position of respect among his business associates in marine affairs.

THE company that bears his name is expanding its activities in cooperation with able and experienced shipping men.

IN ONE of the executive offices of the Roosevelt Steamship Co., 11 Broadway, New York, is a quiet, soft spoken young man of medium height and medium build. Far from the dynamic type, there is even a suggestion of the lackadaisical. Yet this young man has packed more action into his forty-one years than falls to the average lot of a score of men. Soldier, explorer, author and first-class shipping man, he is Kermit Roosevelt, president of the line.

As son of a president of the United States and as the one who accompanied his father on the famous hunting expeditions to Africa and the unexplored jungles of Brazil, Kermit Roosevelt appeared in the day's news early in life; and by his own adventures and achievements has figured regularly most ever since, perhaps most recently in connection with the amalgamation of the Roosevelt line and the International Mercantile Marine.

Kermit Roosevelt's first contact with the marine field was 17 years ago. In South America at the time, in the employ of a Brazilian railroad, among other duties he was placed in charge of the operation of three small but highly temperamental sidewheelers, which plied the Tiete river, in the State of Sao Paulo.

His next active affiliation with marine affairs was upon his return from the World war in 1919, when he became associated with General Goethals in the American Ship & Commerce Corp. A year later he joined Albert E. Clegg, also of the American Ship & Commerce Corp., in the Kerr Steamship Co., serving as vice president.

In 1921, Mr. Roosevelt formed the Roosevelt Steamship Co., operating a number of shipping board boats, perhaps the only completely motorized fleet of size in the world. Under his leadership, this fleet, with its far-flung operations, has been carrying an increasing tonnage each year and has made an unusually successful bid for business out of the Far East. In 1927, he took into the company John M. Franklin and Basil Harris.

Mr. Roosevelt was born in New York City, Oct. 10, 1889. He attended Groton preparatory school, Groton, Mass., and was graduated from Harvard in 1912, with the degree of bachelor of arts. It was before graduating from Harvard, however, that he accompanied his father on the big game expedition to Africa. This was in 1909-10.

Upon leaving Harvard he went to South America, where he remained for five years. There, in addition to his work with the Brazilian railroad, he was engaged for two years in banking in Argentina and Chile. He assisted in establishing a branch at Buenos Aires for the National City Bank of New York. Later he joined his father on the expedition into the Brazilian jungles—the justly famous "River of Doubt" expedition.

Early in the World war Mr. Roosevelt went to England and in July, 1917, obtained a commission as captain, serving in a motor machine gun division in Mesopotamia. A year later he was transferred to the seventh field artillery, first division, United States army. He received the British military cross and the Montenegrin war cross, and Order of Danilo.

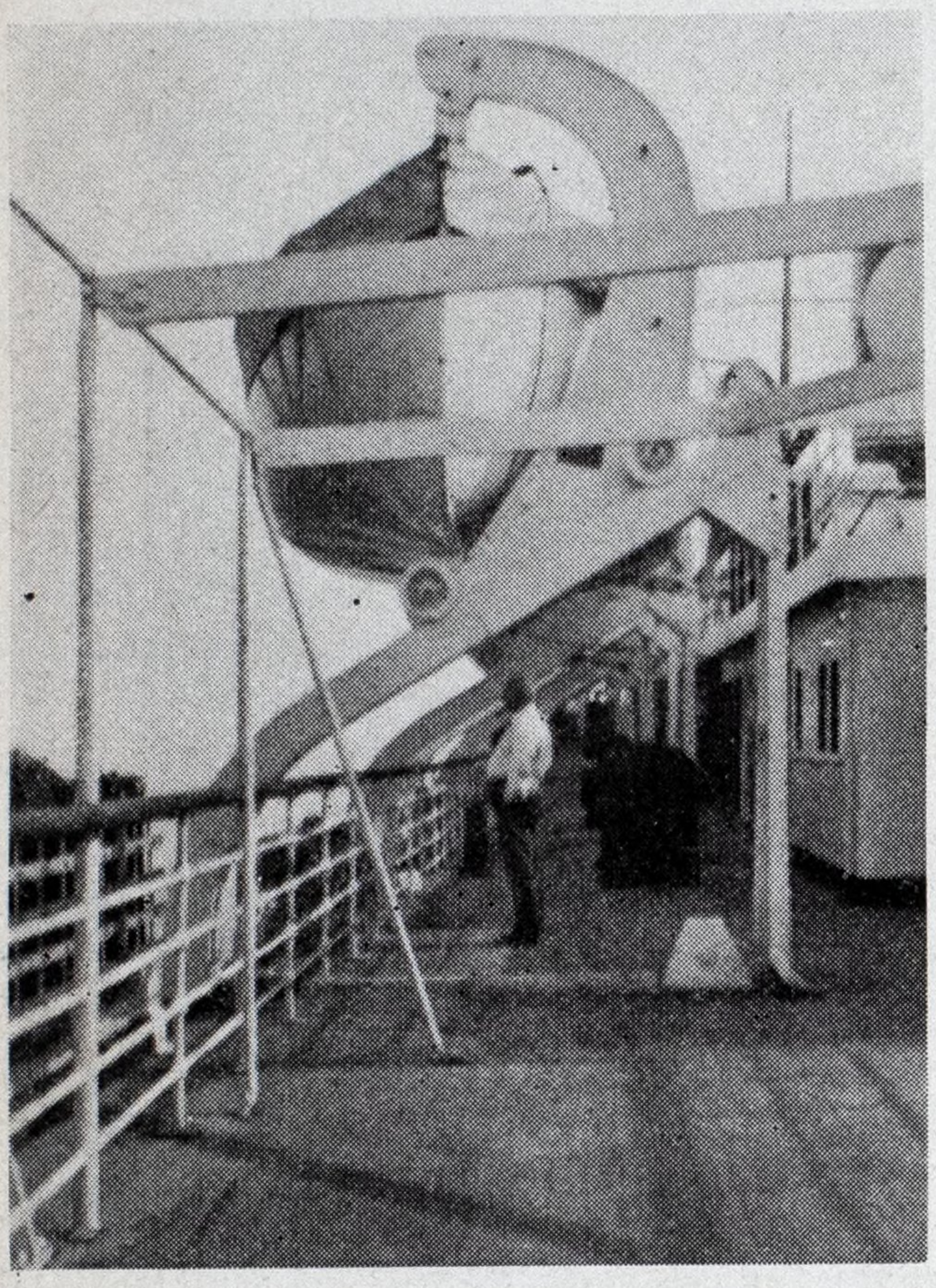
His business affiliation since his return in 1919 has not interfered with new adventures in odd corners of the globe. In fact, his affiliation in some ways offered even new opportunities. For instance, in 1923 he was off on a business trip to Japan. Soon news came filtering through that Kermit Roosevelt was on a tiger hunt in Korea.

More recently he has been off on two major expeditions. Both were difficult journeys into Central Asia and both were in company with his brother, Theodore. Sponsored by the Field Museum of Chicago, these expeditions took place in 1926 and in 1929, respectively, and netted important contributions. The books "*East of the Sun and West of the Moon*" and "*Trailing the Giant Panda,*" written by Kermit Roosevelt in collaboration with his brother Theodore, portray vividly their experiences.

Mr. Roosevelt is a trustee of the American Museum of Natural History and a member of the board of the New York Orthopoedic hospital. He is a member of India house, and among various other organizations, the Knickerbocker club and the Piping Rock country club.

Life Saving Equipment on S. S. Morro Castle

THE S. S. MORRO CASTLE, built by the Newport News Shipbuilding & Dry Dock Co. for the Ward line, is equipped throughout with the most modern life saving equipment. The MORRO CASTLE was launched Mar. 5, completed Aug. 16



The special type gravity davit with cradle holding lifeboat on board the Morro Castle

and sailed on her maiden voyage New York to Havana Aug. 23. A comprehensive article describing and illustrating this vessel appeared in the September number of MARINE REVIEW.

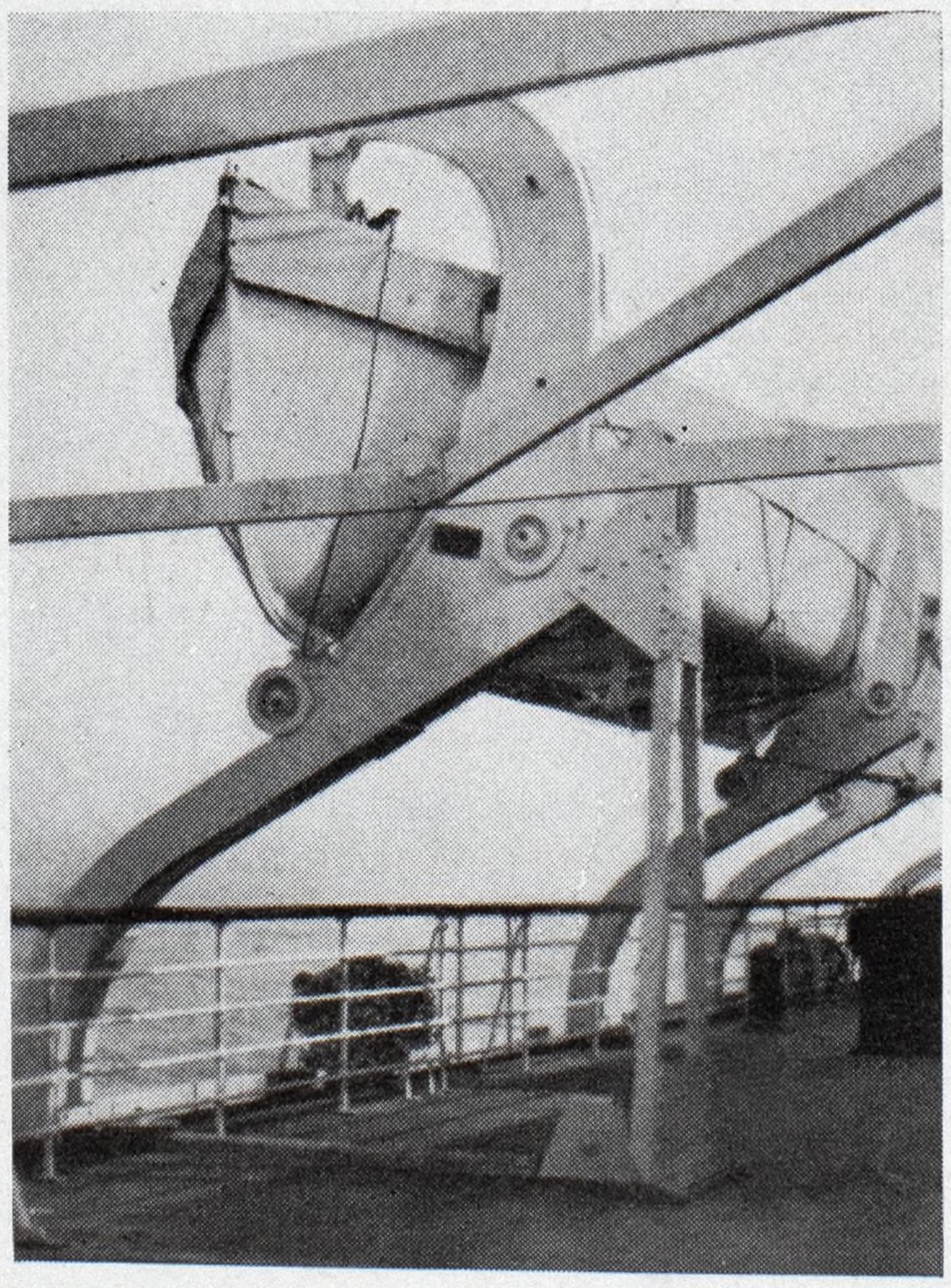
Life saving equipment comprises ten 30-foot 70-person lifeboats and two 30-foot 58-person motor lifeboats. These lifeboats are handled by special davits of the gravity type. In addition to the lifeboats there are twelve 16-person balsa box floats which provide a large margin of safety and are more than required by law. All of the equipment is in accordance with the findings of the international convention for the safety of life at sea, held in London May, 1929.

The lifeboats are constructed of 14-gage copper bearing galvanized sheet steel, built over a one-piece bar steel keel and are fitted with removable air tanks, footlings and floors. In order that each fall may be unhooked simultaneously, and only when the lifeboat is waterborne, a special releasing gear is fitted to each lifeboat.

The motor lifeboats are built in the same manner but are fitted with 18 horsepower Palmer engines with hand starter. Each motor lifeboat is powerful enough to take five of the lifeboats in tow.

The special type of gravity davit with which this vessel is equipped is said to be of very great efficiency and has been included in the life saving equipment of such vessels as the SANTA CLARA, ORIENTE, the two new Dollar liners and the three new Matson liners. Great ease of control is one of the unusual features of these davits. The lifeboats are handled by single wire rope falls each operated on grooved drums which in turn are controlled by an efficient counterweighted hand brake located on the worm gear shaft. By raising the counterweight, the davits and lifeboat automatically travel outboard and down to the water. By merely dropping the counterweight, the lifeboat can be stopped at any desired position. One man is all that is required to release and lower the lifeboats. As the boats are lowered by gravity, no mechanical or manual force at all is used. The trackways down which the cradles carrying the lifeboat roll, extend below the boat deck to the promenade deck and thereby form very efficient tween deck supports. On this account, the gravity type davits instead of setting up stresses as the ordinary mechanical davit is liable to, actually tends to strengthen the superstructure of the ship.

Stowage of the lifeboats seven feet above the deck leaves a clear deck available for the use of passengers. This is a particularly desirable feature in vessels operated on voyages to tropical seas as the boat deck is the coolest and therefore greatly appreciated.



The lifeboat davits on the Morro Castle are so mounted on deck that clear headroom is available

Each set of davits is within the length of the lifeboat handled so that the total length required for the six sets of davits on each side of the MORRO CASTLE would be sufficient to accommodate only five davits of ordinary size. Thus, besides being efficient in operation this davit is also economical in regard to space required.

Each lifeboat is returned to its stowed position on board ship by an efficient worm geared winch driven by an electric motor. These motors, together with their controllers and limit switches were supplied by the General Electric Co.

This modern life saving equipment of the MORRO CASTLE was manufactured and supplied by the Welin Davit and Boat Corp. of Long Island City, N. Y. The sister ship of the MORRO CASTLE, the ORIENTE, is also to be fitted with the same type of life saving equipment.

Submarine Commander Dies at Philadelphia

Rear Admiral Albert Weston Grant, pioneer commander of the United States submarine flotilla and head of the Atlantic fleet during the World war, died at Naval hospital, Philadelphia, on Sept. 30. He was 74 years old. During his more than 24 years of sea service before his retirement in 1920, Admiral Grant commanded the FROLIC, and ARETHUSA and the CONNECTICUT and was the first commander of the U. S. S. TEXAS, present flagship, when the ship was commissioned in 1913. As a captain he was placed in command of the submarine flotilla of the navy in 1915 and during the same year was commissioned a rear admiral and commanded the 24 capital ships comprising the first line of the Atlantic fleet during the war.

Gets Diesel Engine Order

In competition with manufacturers from every section of the country the Washington Iron Works, Seattle, Wash., has been awarded the contract to furnish two 350 horsepower diesel engines for the Panama canal. Bids were opened Sept. 5 and the contract signed this month. The engines are now under construction and will be shipped from the local plant in late November.

The engines are 8 cylinder Washington marine diesels of the double end direct reversing type and will be installed in two ferry boats of the double ended type for service in the canal. The units are regular 440 horsepower but have been re-rated to meet the specifications of the government. These are the first diesel engines from the Pacific coast.

Storm Destroys Lone Survivor of Old Windjammers

THE gale which raged on Lake Michigan on Sept. 26 claimed the last of the old fleet of sailing ships once the pride of Great Lakes shipping men. The little schooner OUR SON, carrying a load of pulpwood, foundered off Ludington, Mich., about an hour after her crew was rescued. The steamer WILLIAM NELSON sighted the OUR SON flying distress signals about 3:30 p. m. and immediately headed for the ship. A terrific sea was running and fearing that rescue of the crew might be impossible, distress signals were sent to the carferry Pere Marquette 22, which stood by, but the crew of the schooner was rescued before the carferry could assist.

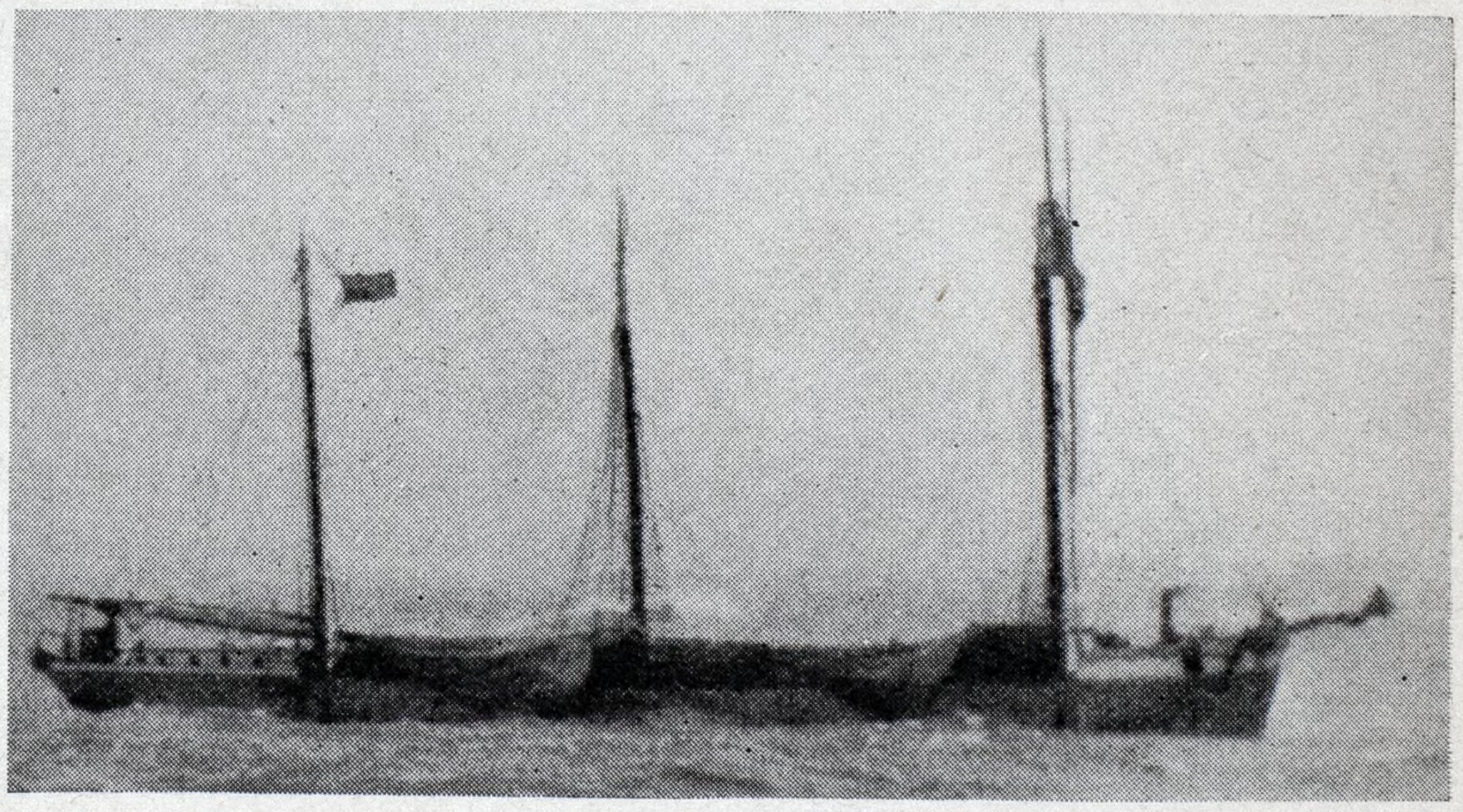
Built in 1875 at Black River, O., by Capt. Henry Kelly of Milan, O., the OUR SON was considered one of the most striking ships of her time. She measured 182 feet over all, 35 feet beam and 13 feet deep, with a gross tonnage of 720. Her total construction cost approximated $6000 and her carrying capacity ranged from 1000 tons of ore to 40,000 bushels of grain. When loaded and with a favorable wind, she logged 12 to 15 miles an hour. She was barque-rigged, carrying a foremast, mainmast and mizzenmast, square-rigged forward, and was regarded a thing of beauty by all sailing ship enthusiasts who knew her in the early days. This sentiment is well expressed in the following excerpt from a letter just received from August F. Semper, a MARINE REVIEW subscriber:

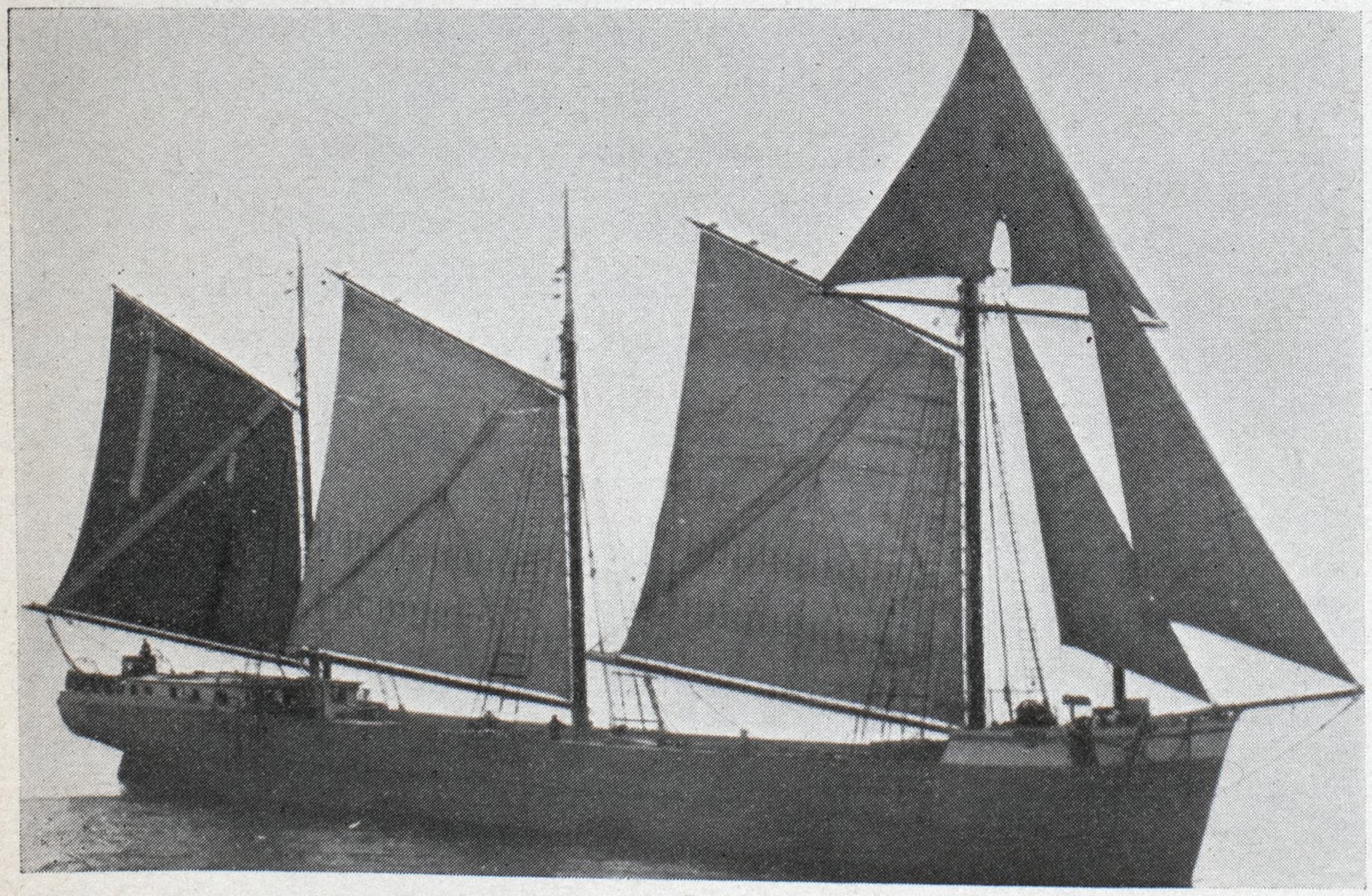
"The OUR SON was one of the most beautiful ships of her time and it was my good fortune to meet her in my early sailor days on many trips in weather both fair and foul. A most pleasing picture she made, coming along at a great rate of speed under a full spread of canvas. From far-off I could distinguish her as the OUR SON for on her lower topsail were painted the letters O. S. I considered myself fortunate when I met her once again, three years ago, in Muskegon harbor. True enough, she had lost her former beauty, having been cut down in rig; but she was still a serviceable ship and a reminder of the great days of sail. A picture of the OUR SON in your magazine will be appreciated by the older generation of sailors for the memories it will awaken and by the younger men for the contrast between then and now."

When the OUR SON entered the ore and grain trades on the Great Lakes, the era of the wooden ship was at its climax and the sailing ship reigned supreme. Steam was used only when the wind was unfavorable and it was necessary to engage a tug to tow the ships out of a river into the open lake. However, as the steam engine increased the speed of ships, the sailing ship was gradually relegated to the background. In time the OUR SON became a stone carrier, the rig of the schooner was changed and in her later days she carried lumber. She averaged seven trips a season to Detour, Manitoulin islands and along the Canadian shore of Lake Huron, transporting pulpwood logs for the Central Paper Co.'s pulp mill at Muskegon, Mich., to which company she was chartered by her owner, W. J. Schlosser of Milwaukee. The schooner's record year was 1927, when she made 10 trips.

Captain Fred Nelson, her 73-year-old skipper, with a record of 59 years of sailing on salt and fresh water, was rescued with his crew of six men. Commenting on the schooner Captain Nelson said: "The OUR SON was a noble ship. Nearly all the steamers saluted her, for many of their masters remembered the days when she was one of a big fleet of sailing vessels on the Great Lakes. She made steamboat time, 14 miles an hour with a good wind."

Schooner Our Son abandoned on Lake Michigan Sept. 26, 1930. Crew rescued by steamer William Nelson. This photograph was taken from on board the steamer Pere Marquette 22, Capt. W. H. Van-Dyke, which ship also stood by to give aid. Photo by Ferris





This view of the schooner Our Son was taken some years ago by W. E. Warehime from on board the steamer Pentecost Mitchell

Decision in Tahiti Case

According to the findings of the nautical court of inquiry held at Wellington, N. Z., the loss of the Union Steamship Co.'s steamer TAHITI in the Pacific on Aug. 14 was due to the breakage of the tail shaft, probably by diagonal or scarf fracture, resulting in overriding of the end, causing puncture of the hull and injury to the base of the watertight bulkhead. It is noteworthy that the court held further that this was a peril of the sea which no reasonable human care or foresight could have avoided and that the ship was staunch and well found. It awarded the highest praise to all concerned in dealing with the situation, and it referred especially to the "resource and cool and accurate judgment of the master and the courage and endurance of the engineers."

New Pulverizer Described

(*Continued from Page* 89)

sulting from grinding, is imposed on the thrust bearing because the mill is so designed that all thrust from this source is absorbed by the heavy lower casing.

No lubrication is required within the grinding zone of the pulverizer. All bearings and gears are effectively sealed from the grinding zone and are lubricated by an automatic forced-feed oiling system.

The pulverizer is driven by a constand speed motor which consumes little power regardless of the mill's output. Control is simple because only a few adjustments are needed to change the boiler output. The mill is particularly well suited to serve both large and small direct-fired boilers including those units which have rapidly fluctuating industrial loads.

These pulverizers are built in capacities up to and including 40 tons of coal per hour.

Lightship Completes Run

The new lightship FIRE ISLAND, number 114, recently completed a practically nonstop run from Portland, Ore., where she was built by the Albina Marine Iron Works, to New York City by way of the Panama Canal, a total distance of 6286 miles. This is said to be the first lightship to pass through the Panama canal. It is to be operated under the third lighthouse district, Staten Island, N. Y.

This vessel which is a sister ship of the new diesel electric lightship BLUNTS, an illustration of which was shown in the August number of MARINE REVIEW, is fitted with Goodrich cutless rubber stern tube bearings, as are also the lightships BLUNTS and SWIFTSURE, both building by the Albina Marine Iron Works, Portland, Ore., and the FRYING PAN, FENWICK and NANTUCKET, building by the Charleston Dry Dock Machine Co.

Annual Report Received

The thirty-first annual report of the American Ship Building Co. for the fiscal year ended June 30, 1930 has been received. The volume of repair business carried on by the company exceeded that of last year by more than $200,000. Miscellaneous small contracts and industrial engineering business also exceeded the previous year, but new ship construction was unusually small so that the total volume of business for the year was approximately $625,000 less than for the year 1929. Notwithstanding this fact, however, operating profit for the year was greater than during the previous year.

During the year, the company sold its vacant north yard property in Chicago, the vacant west yard property in Milwaukee and a part of its land and buildings located on the old viaduct in Cleveland.

Rear Admiral H. J. Ziegemier, commandant of the 13th naval district at Bremerton, Wash. for the past two years, died on Oct. 15 after a paralytic stroke while engaged in a golf tournament. He was 61 years old. During the World war Admiral Ziegemeier commanded the battleship VIRGINIA and operated with the Atlantic fleet until the summer of 1918, when he was made a convoy commander, escorting troops to France. Later he commanded the CALIFORNIA when she was commissioned, acted as director of naval communications at Washington, commanded the Norfolk navy yard and in 1927 commanded the third battleship division of the United States fleet on the cruise to Australia and New Zealand.

Higher Steam Pressures

Sir Charles Parsons, speaking to a gathering of shipping men and engineers on board the steamer KING GEORGE V at the recent engine performance trials of this vessel, which was the pioneer in high-pressure turbine installations was quoted as saying that he regarded the experience with the KING GEORGE V, which has just completed another succesful season with boilers operating at a pressure of 560 pounds, as merely a stepping-stone to still higher pressures, and that in a very few years' time all the larger and more important ships will be driven by steam at 1000 pounds pressure or over.

American Bureau Meeting

At the fall meeting of the board of managers of the American Bureau of Shipping held on Oct. 21, H. E. Frick, vice president of the Export Steamship Corp., and Gilbert Mather of Mather & Co., Philadelphia, were elected to membership, Captain C. A. McAllister, president of the bureau, reported it to be in prosperous condition and told of the efforts being made to assign as rapidly as possible the loadlines fixed for vessels in foreign trade by the new loadline law under which the American Bureau has been made the official assigning authority. Among those attending the meeting were Franklin D. Mooney, Walter Wood Parsons, Joseph W. Powell, William H. Todd and F. P. Palen.

The cruisers CHARLOTTE and MISSOULA which have been laid up since 1921 have been sold by the navy department to the Moore Dry Dock Co., San Francisco, for $177,972 each.

Modern Electric Galley

(*Continued from Page* 67)

at any desired point between 100 and 600 degrees Fahr. Control of the top and bottom heaters in each section by a separate 3-heat switch, further insures accurate baking conditions.

Sectional construction of bake oven insures ease of installation, all parts being of such size as to be readily moved through an average door opening. This feature is of particular importance where old equipment is being replaced by new, as the cutting away of door passages and bulkheads is eliminated.

The various pantries include first class, coffee and cold pantry, promenade deck pantry, and the officers pantry on the sun deck. These are all equipped with electric griddles and toasters, and in some cases electric waffle bakers as well.

In addition to the electric cooking and baking equipment as outlined, these galleys are all electric, as bread and cake mixing machines, peelers, etc., are electrically operated.

There are other ships of the Ward line equipped with electrical cooking and baking equipment. In fact, it may be said that successful results with other vessels was the determining factor in the use of electrical equipment for these two new de luxe liners.

In addition to the Ward line, Westinghouse electric galley equipment is found on vessels of the New York and Porto Rico Steamship Co., Matson Navigation Co., Eastern Steamship Co., United States Army Transport service, Alaska Steamship Co. and many others.

M. W. Oettershagen, Chicago harbor engineer, was elected president of the American Association of Port Authorities at their nineteenth annual convention in Milwaukee on Sept. 24, to succeed Major General W. L. Sibert of Mobile, Ala. The 1932 convention will be held in Philadelphia.

Error is Corrected

In the description of the river towboat OHIO published in the October issue of MARINE REVIEW, credit was given to the Elliott Co. for feed water heater equipment. Our attention has been called to the fact that while the first stage open feed water heater was supplied by the Elliott Co., the Davis Engineering Corp. supplied the second stage feed water heater as well as a Paracoil evaporator, Paracoil evaporator feed preheater and a Paracoil fresh water distilling plant consisting of an evaporator, condenser, cooler and water filter.

New Trade Publications

PUMPS — In its booklet *Warren Pumps and the Organization Behind Them* the Warren Steam Pump Co. Inc., Warren, Mass., gives a brief history of the company since its inception in 1897. The installation of Warren pumps in various classes of ships is touched upon, including passenger liners, tankers and naval vessels. The concluding pages are devoted to industrial installations covering every branch of industry. The booklet is well illustrated with shop scenes of the Warren plant, views of various types of ships and units installed in power and industrial plants.

TANKS AND CONTAINERS — Two bulletins have been issued by the American Welding Co., New York. One gives details of construction and other data on forge welded containers for the shipments of compressed gases and liquids. The other shows construction of forge welded storage tanks and pressure vessels for other purposes.

CHAIN — Silent and roller chain manufactured by the Union Chain & Mfg. Co., Sandusky, O., is described in a catalog just issued. Data on these types of chain are supplemented by engineering tables of use to chain users. It also contains data on sprockets and on chain attachments for special purposes.

MATERIAL HANDLING EQUIPMENT—A folder by the Truscon Steel Co., pressed steel division, Cleveland, calls attention to savings made possible in materials handling by use of the company's all steel boxes, skid platforms and factory trucks.

WELDING—The Babcock & Wilcox Co., 85 Liberty street, New York, has issued a new bulletin on fusion welding, describing a new method of welding which eliminates the necessity of long training or great skill in operators and produces welds equal to or better than the work metal in tensile strength, shock resistance, ductility and ability to withstand repeated stresses. The bulletin is illustrated and contains descriptions of test specimens, chemical analysis, macrographs and photomicrographic studies. Copies may be had by addressing the company.

ELECTRODES—Fusion Welding Corp., 103rd street and Torrence avenue, Chicago, has published a circular describing its weldite green surfaced electrodes for metallic arc welding of mild steel. The bulletin gives in detail the effect of green surfacing on the welding arc, the deposit metal and operating characteristics of the electrode and explains why welding costs are reduced. Valuable information for users of welding is included in the circular, which will be sent to anyone upon request.

ENGINE INDICATORS—A bulletin covering recent developments in Maihak engine indicators has been issued by the Bacharach Industrial Instrument Co., 7000 Bennett street, Homewood station, Pittsburgh. The bulletin contains a complete description of the indicator as well as parts and accessories and is amply illustrated with halftones and line drawings.

CONTRARUDDER—Th. Goldschmidt Corp., 68 Beaver street, New York, has issued a folder on the contrarudder, which is a combination of the contrapropeller with a streamline rudder, designed to straighten out the propeller jet so as to reduce resistance and improve the steering of a ship. The principle of the contrarudder is well illustrated by line drawings and the folder contains other interesting data.

MARINE BATTERIES — Electric Storage Battery Co., Philadelphia, has issued a bulletin devoted to the proper method of installing and operating Exide marine batteries. The booklet is illustrated, describes the Exide marine floating battery system, and gives a general summary of essentials to assure proper operation and life from Exide batteries in their varied and numerous marine installations, for the floating system, for wireless, lighting, starting and ignition of gasoline engines and for other services.

VALVES—Bulletin No. 141 describing and illustrating Jenkins standard bronze valves with the one-piece screw-over bonnet and slip-on stay-on disc holder was recently issued by Jenkins Bros., 80 White street, New York. The valves described are made in globe, angle, cross and check types for all standard services. Copies of the bulletin will be sent upon request.

FATHOMETER — Submarine Signal Co., Boston, has issued a folder dealing with the installation of fathometers on trawlers. The advantages gained through this equipment are outlined and the folder contains testimonials from various users. A separate folder covers the successful operation of the fathometer aboard the steamers Yale and Harvard of the Los Angeles Steamship Co.

FLOOR TRUCKS — Lewis-Shepard Co., Watertown Station, Boston, has just issued a catalog covering its new and complete line of standard and special floor trucks. This unique line of floor trucks, designed to meet specific problems, is arc welded at every practical point and now forms a complete unit of the materials handling equipment made by the company, including jacklifts, stackers, platforms and racks. The company is equipped to furnish these floor trucks in any design and a copy of the catalog may be obtained by addressing the company at 125 Walnut street.

HIGH PRESSURE STEAM—In a pamphlet entitled *A Pioneer in High Pressure Steam,* the DeLaval Steam Turbine Co., Trenton, N. J., describes the early work of Dr. DeLaval, including the original features of the Stockholm exhibition in 1897. Many drawings and photographs of early designs are reproduced, together with illustrations of more modern apparatus of similar characteristics, including high pressure turbines and pumps, speed reducing gears, etc.

CRANES—Bedford Foundry & Machine Co. Inc., Bedford, Ind., believes production may be increased and materials may be handled much more cheaply by use of its cranes in a variety of ways in industry. A current bulletin illustrated means by which this may be accomplished.

Business News for the Marine Trade

Effective Sept. 29, the Philadelphia sales office of Cutler-Hammer, Inc., will be located on the tenth floor of the new Terminal Commerce building, 401 North Broad street. These new quarters also include warehouse facilities where a stock of the more popular C-H motor control, wiring device and safety switch items will be carried for immediate delivery. F. J. Burd is manager of the Philadelphia district for Cutler-Hammer, Inc.

R. W. Cramer & Co., distributors of Swiss precision instruments including Sauter time switches, have moved to 6769 Irving place, New York, where they occupy the entire eighth floor.

The Virginia State Port Authority has granted a permit to the Chesapeake & Ohio railway to build two commercial piers at Newport News, to cost approximately $2,000,000.

New York Shipbuilding Co., Camden, N. J., will add two shipways, with shop facilities. Plans are being made for a new building unit. Work will be started in the fall.

The Merritt-Chapman & Scott Corp., New York, recently organized a marine department to conduct all salvage, diving, derrick and lighterage operations of the corporation under the direction of Captain Walter N. Davis, vice president; Lewis L. Smith, assistant vice president, and Hubert M. Vanderbilt, traffic manager. The purpose in organizing the new department is to provide centralized control in order to give better service to patrons of the corporation, which has extensive industrial interests aside from its marine functions.

The Buffalo Waterfront Corp., recently incorporated with a capital of 1000 shares of no par value, will operate a freight forwarding and steamship agent business. The principals in the new concern are Daniel A. Dorsey, Flushing, L. I.; E. E. Kettner, Woodhaven, and M. G. Kaufman, New York.

Excavation work for the extension of dry dock No. 2 at the Puget Sound navy yard, Wash., is well advanced. The dock will be extended 57½ feet so as to accomodate the largest navy craft. An appropriation of $280,000 is available.

The Murray Barge Co., Troy N. Y., was recently incorporated by Foley & Martin, 64 Wall Street, New York, with 100 common shares.

The Inland Water Transport Co., Ltd., was recently incorporated under the laws of Delaware by Harry Feld, New York at $200,000.

Alabama state docks commission, Mobile, opened bids July 14 for furnishing and constructing a transit shed along south side of Pier C; 120 x 1180 feet, structural steel frame, corrugated sheet metal roof and sides, rolling steel doors, concrete floor, shed columns to be supported on timber, piled, capped with concrete.

Aviation Corp. of America, 100 East Forty-second street, Philadelphia, has applied to the mayor of that city for a lease of 22 acres in the Air-Rail-Marine terminal at Hog Island. The company will manufacture seaplanes in a plant to be erected. First unit will contain about 50,000 square feet of floor space. Future expansions may increase plant size to 60,000 square feet.

Majority of Marine Accidents Held Preventable

By Byron O. Pickard

THIS paper will bring before you a discussion of the analytical studies made in my department of 7754 lost-time injuries to longshoremen on docks and ships employed in the Pacific Coast ports of San Francisco, Los Angeles, and Portland, and 1899 lost-time injuries to seamen employed by the Pacific American merchant marine.

The program for prevention of accidents adopted by the department is based on the assumption that there are only two reasons for accidents, viz., uncontrolled hazards and exposure to hazards.

Included in the uncontrolled "hazards" of our industry are mechanical defects; condition of materials; working conditions, practices or methods; habits indulged in and tolerated; attitude, aptitude, and physical condition of workmen; and what is most important, lack of preparation and organiation for a job. "Exposure" may be considered as the length of time that a workman is exposed to the hazards and the length of time it takes for the law of averages (which is the gauge of the severity of a hazard) to catch up.

It may be roughly assumed that approximately 75 per cent of all industrial injuries could have been prevented by those injured if they had been properly trained, properly disciplined, physically fit and properly selected for the job.

It is known that there may be more than one cause of an accident. Accordingly, I use two separate classifications, viz., one called "primary" the other "contributory" causes.

To illustrate what is meant by the foregoing: "a man is struck by a falling boom which dropped through the failure of a topping lift." The primary general cause of the accident according to the department's classification is "falling object"; whereas, the principal contributory cause is "gear failure"; the failure may have been due to a poor or unsafe practice, to over-loading, to lack of inspection, etc.

It now has been thoroughly drilled into the office staff that to attribute the carelessness or drunkenness of a workman as the main contributory cause of an accident is to confess lack of capable supervision and that certainly such an abstract cause as carelessness suggests no corrective.

The twelve most important detail causations, the total of which caused more than three-fourths of all the reported lost-time injuries to Pacific Coast longshoremen, are: Struck by falling objects, not otherwise classified, 11 per cent of the total; struck by moving hook or sling load, 9 per cent; slipping, falling and stumbling, 8 per cent; improper or overlifting, 7 per cent; striking or bumping against inanimate and stationary objects, 7 per cent; getting caught between objects being handled and a fixed object, 7 per cent; struck by shifting, moving, and falling loads on trucks, jitneys, etc., 7 per cent; striking against sharp or rough objects while handling, 5 per cent; struck by cargo falling from piles, 5 per cent; struck by or run over by jitneys, trucks, or trailers, 4 per cent; struck by cargo falling from slings, 4 per cent; struck by materials dropped while carrying, 3 per cent of the total.

Each of the above detail causes accounted for from 250 to 840 injuries with a total of 6000 out of the 7754.

Some of the more important detail causes of injuries to seamen, each accounting for more than 5 per cent of the accidents resulting in disabling injuries, are: slipping, tripping and stumbling; striking or bumping against miscellaneous objects not being handled, such as nails, splinters, railings, machinery, etc.; falling from ladders; burns in the engine room and galley; struck by own hand-tool; struck by miscellaneous falling objects; sprains and strains; struck by flying object, by ship machinery (shops only), by ship machinery, other than shop and deck machinery; physical violence.

Of the foregoing detail causes, "slipping, tripping and stumbling" is three times as great as any other.

TABLE I

General Causes of Accidents Resulting in Lost-Time Injuries to Pacific Coast Longshoremen

General Causes	No. of Accidents Reported: San Francisco Bay 1927-1929, Inc.	Los Angeles Harbor 1928-1929, Inc.	Columbia River 1929	Totals: Per Cent	No. of Accidents
Hand-handling Objects	1061	641	171	24	1873
Falling Objects	1048	549	176	23	1773
Moving Objects	538	293	118	12	949
Falls of Persons	530	229	120	11	879
Haulage Equipment	476	337	61	11	874
Striking Against Objects not Handled	322	171	69	8	562
Hand Tools	170	85	25	4	280
Flying Objects	117	85	8	3	210
Stepping on Objects	89	52	15	2	156
Fire, Hot, Poisonous or Corrosive Substances	46	47	12	1	105
Machinery	18	6	2	0.5	26
Commercial Traffic on Docks	17	1	3	0.5	21
Physical Violence, Illness or Occup. Diseases	7	2	0	..	9
Not Apparent from Report	26	11	0	..	37
Totals	4465	2509	780	100%	*7754

*Note: 55% of the accidents occurred to longshoremen working aboard ship.
45% occurred to longshoremen working on the docks.

It is with no thought of comparing the frequency rate in the three harbors that the table has been furnished, but rather with the idea of portraying a group picture of the Pacific Coast and proving that wherever stevedoring is done certain causes are outstanding in frequency.

TABLE NO. II

General Causes of Accidents Causing Disabling Injuries to Seamen on Pacific American Ships—1928 to 1929, Inc.

General Causes	Accidents Reported: Tankers Per Cent	Tankers No. of**	*Gen. Cargo Per Cent	*Gen. Cargo No. of***	Totals: Per Cent	No. of Accidents
Falls of Persons	30	125	32	475	31	600
Hand-handling Objects	17	70	11	162	12	232
Striking against Objects Not Handled	12	48	8	120	9	168
Moving Objects	6	25	7	111	7	136
Machinery	5	21	8	114	7	135
Falling Objects	7	28	7	104	7	132
Fire, Hot, Poisonous Substances	5	20	7	99	6	119
Hand Tools	5	22	6	91	6	113
Flying Objects	7	28	4	68	5	96
Physical violence, illness or Occup. Diseases	2	8	5	76	4	84
Stepping on Objects	2	6	3	38	2	44
Haulage	..	1	..	4	..	5
Commercial Traffic	..	...	..	2	..	2
Not Apparent from Report	..	12	..	21	..	33
Totals	100	414	100	1485	100	1899

*Also includes several large passenger carrying vessels.
**Tankers had 63% of accidents at sea; 37% in port.
***General Cargo had 63% of accidents in port; 37% at Sea.

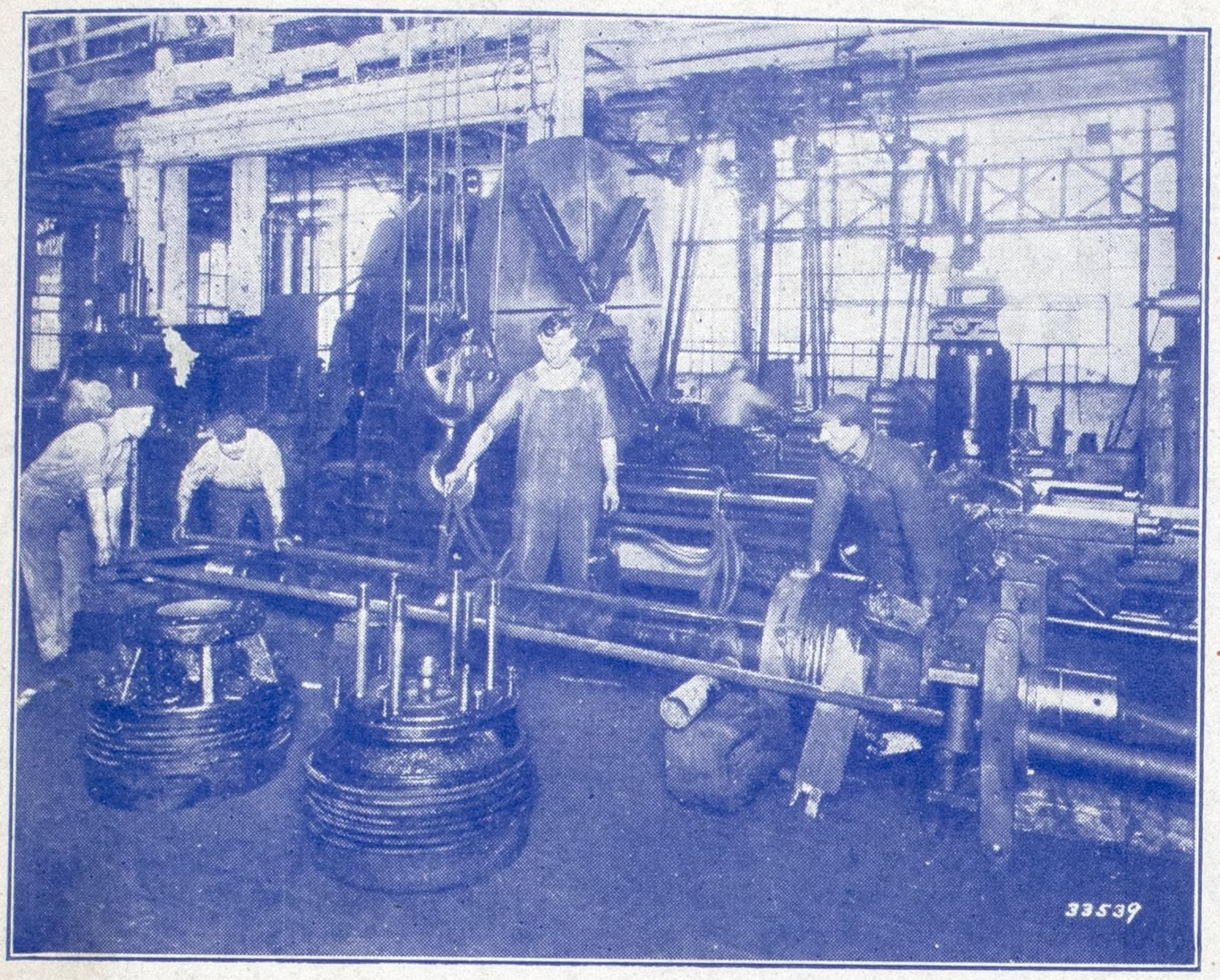
This is an abstract of a paper on marine accident causations presented before the Nineteenth Annual Safety Congress and Exposition held at Pittsburgh Sept. 29-Oct. 3 by Byron Pickard, safety engineer in charge of accident prevention department, Pacific Coast Shipowners' and Waterfront Employers' association, San Francisco.

Marine Review

Reg. U.S. Pat. Off.

The National Publication Covering the Business of Transportation by Water

November, 1930



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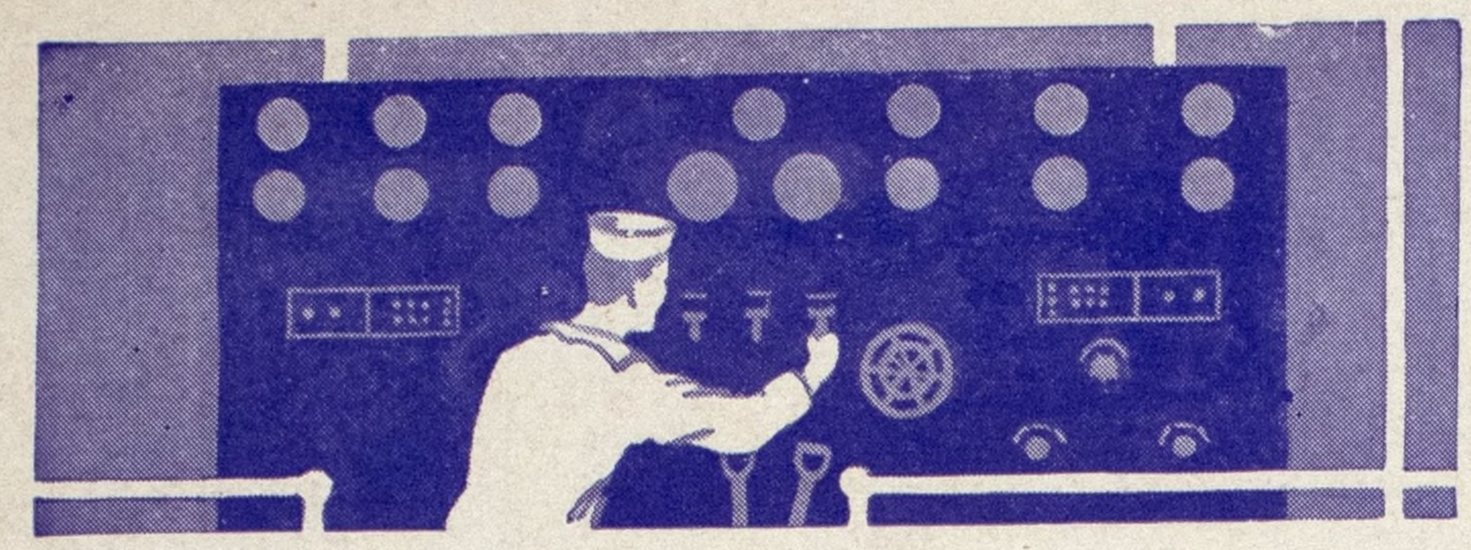

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EVEN to the inexperienced eye, the engine room of the all-electric ship is a marvel of simplicity and completeness. A few electric cables and switches have supplanted the usual network of pipe lines and valves. From a single panel, the operating engineer can diagnose conditions in every part of the power system.

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In this transitional period, the exceptional facilities and practical experience of General Electric are at the disposal of ship builders and ship owners who would keep in step with maritime progress.

173-7

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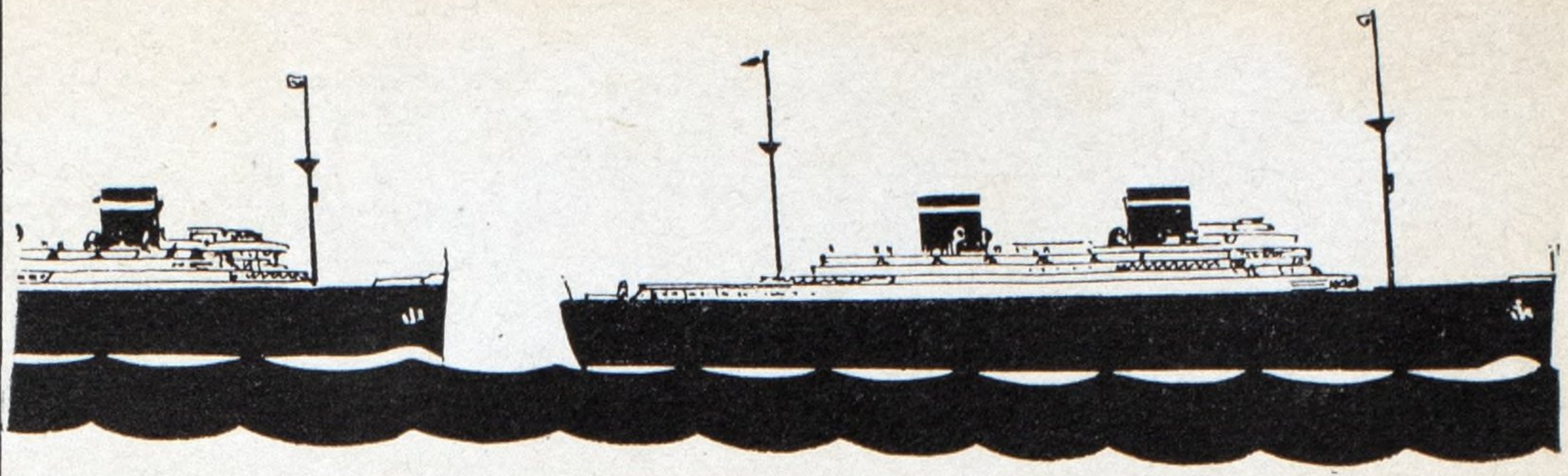
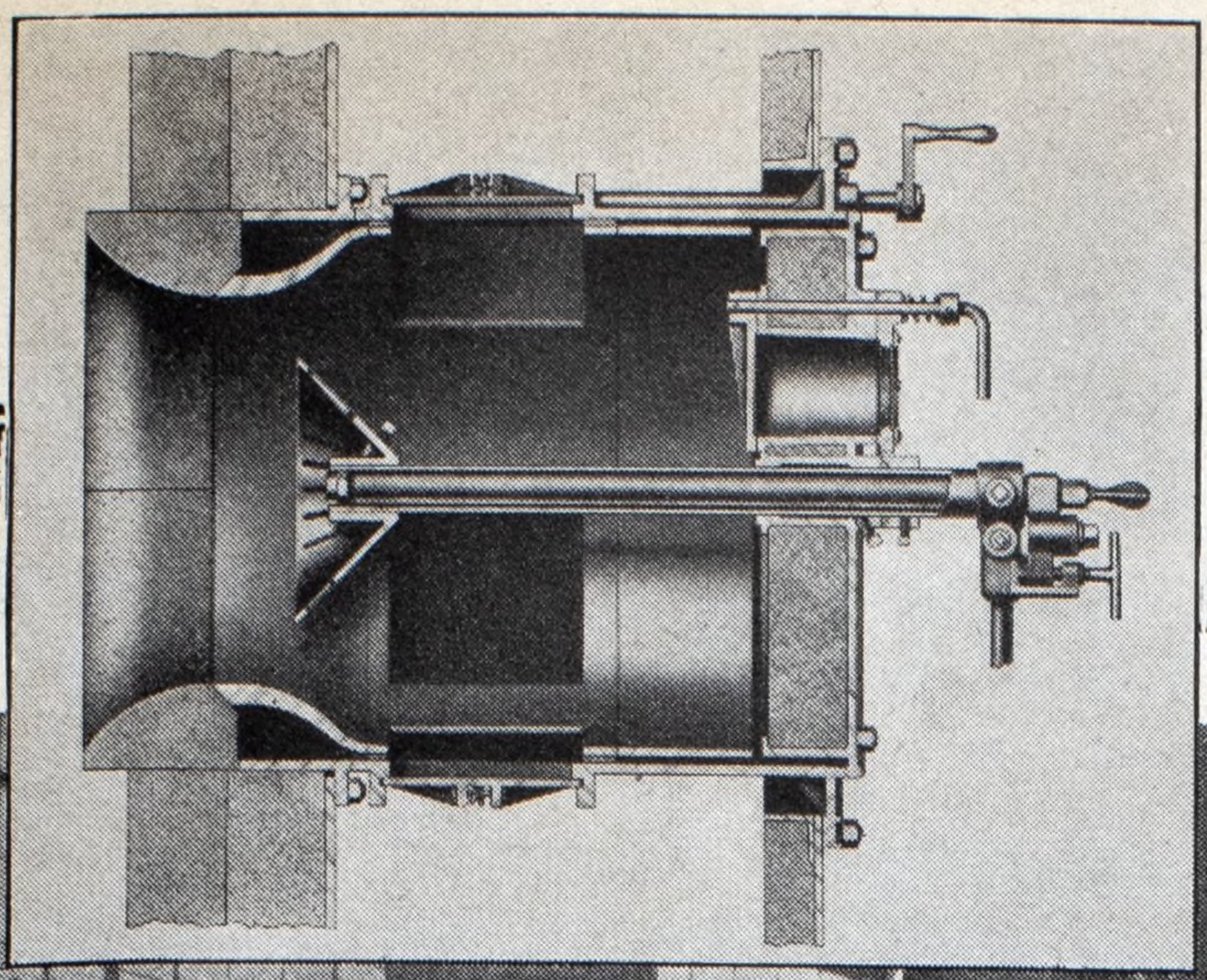
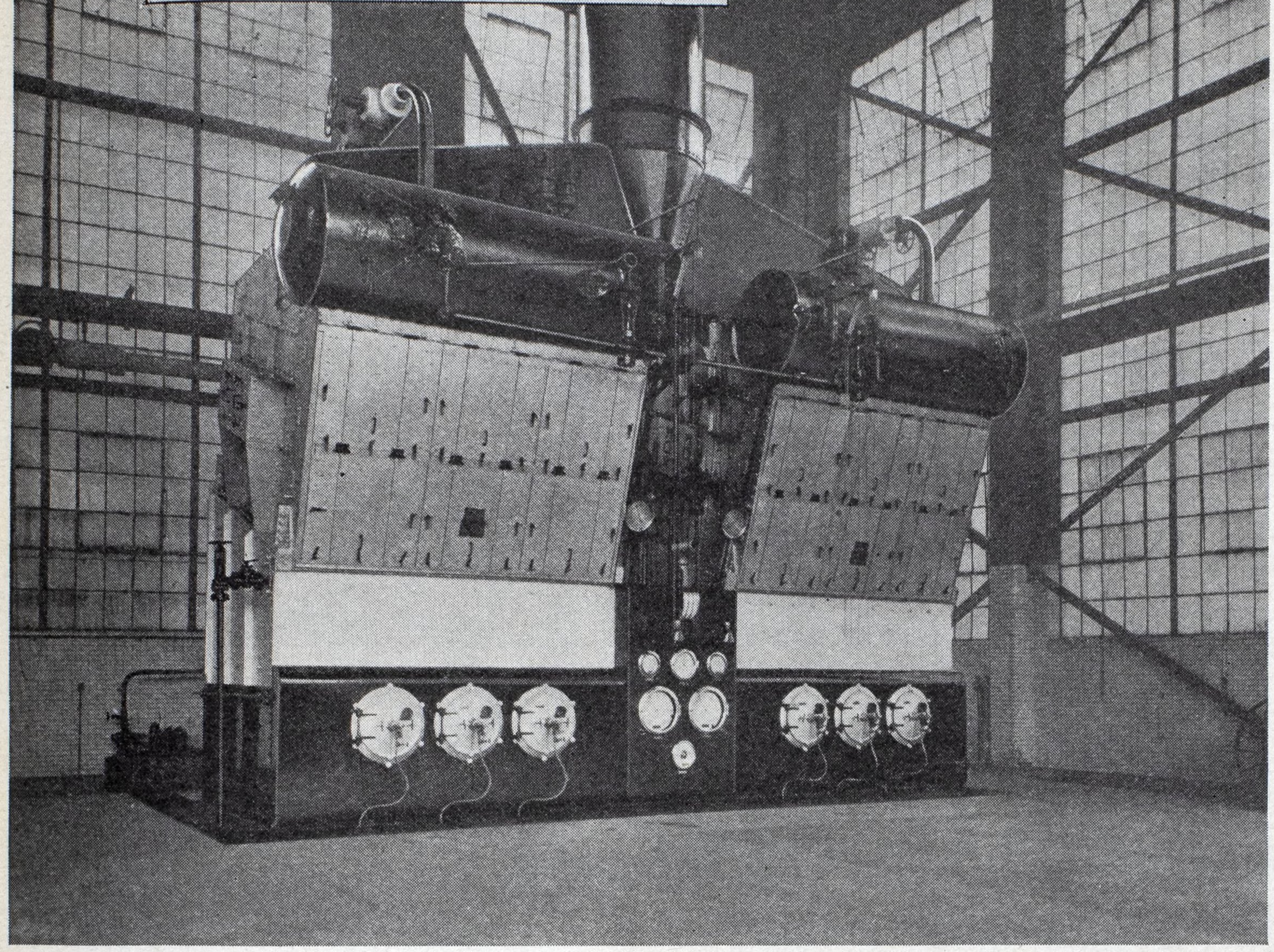
Vol. 60, No. 11, Nov., 1930, issue of MARINE REVIEW, published monthly at Cleveland, Ohio. Entered as second class matter at the post office, Cleveland, Ohio, under the act of March 3, 1879. Subscription price $3.00 a year in U. S.; Canada, $4.00; Great Britain, £1; single copies, 35c.







In Ships that go to Sea . . . . . or in the plants at home ports

The power plant of the Federal Shipbuilding plant at Kearny, N. J., uses 6 Coen Burners and Registers for their own power plant installation. Above is shown a cut-away view of a Type C Coen Register using a Coen Oil Burner.

Coen Registers and Burners are giving satisfactory combustion service in all phases of marine work as well as in the power plants of the shipyards which build the ships. Coen products assure users the maximum heat from a minimum of consumed fuel.

Type C Register is suitable for either natural draft or forced draft pre-heated air. It offers the features of safety, accessibility and ease in installation. Complete frontal insulation, as well as greater capacity with less air pressure, is provided in the design. In conjunction with the burner the register is designed to give a rotary motion to the air used for combustion without the use of air-directing vanes. The Type C Register can be furnished for use with oil, gas or powdered fuel.

Write us for Bulletins No. 16C and 17C, which give full particulars on both burner and register.

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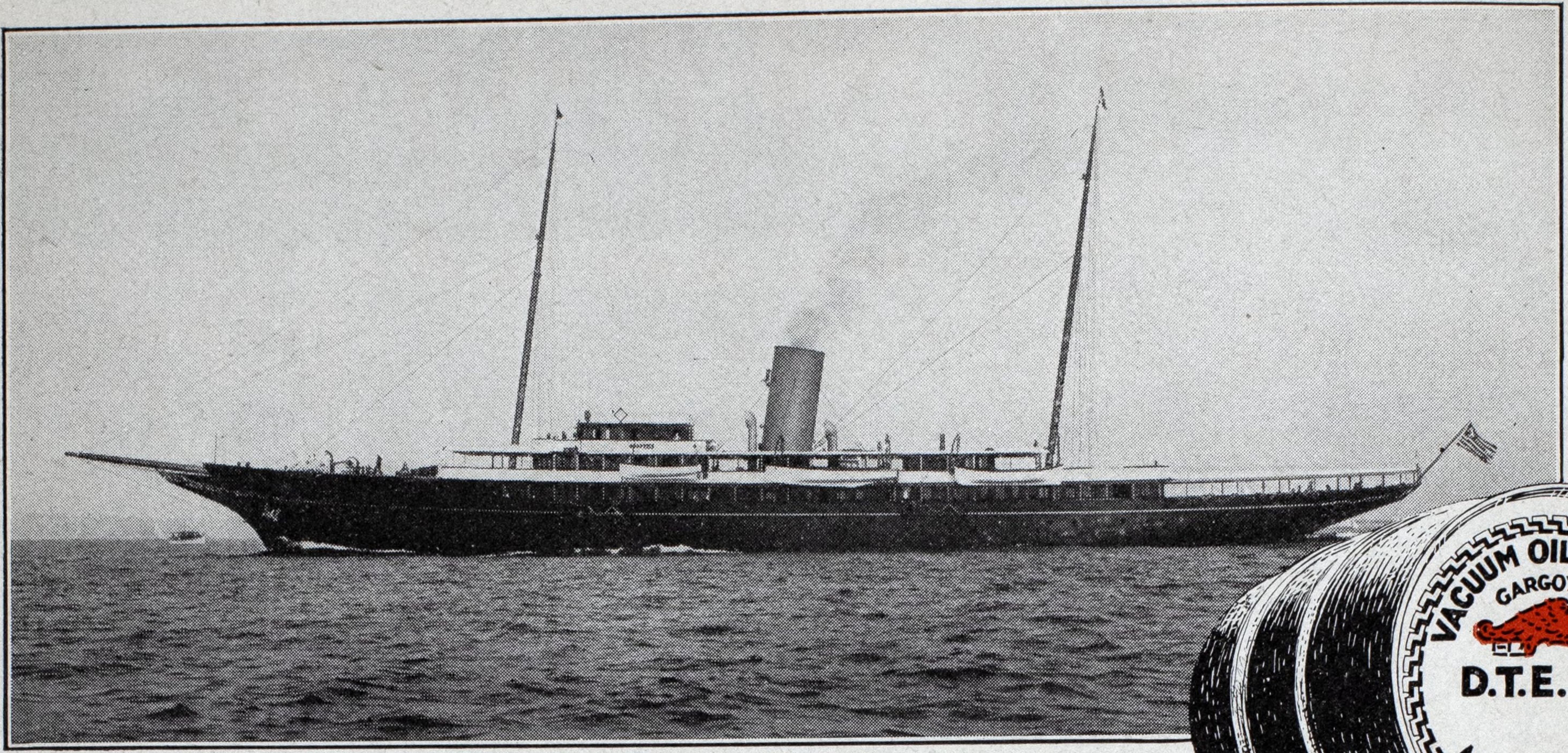

J. P. Morgan's new *Corsair*. Her electroturbine plant develops 6,000 s.h.p., maintaining an average speed of 16 knots.

Latest and largest Corsair lubricated with Gargoyle Marine Oils

Measuring 343 ft. from tip to tip, J. P. Morgan's palatial new *Corsair*—fourth of the name—is the largest privately-owned yacht afloat.

Larger and faster than her famous predecessor, this latest *Corsair* follows the same rakish lines, characteristic of the other black-hulled Morgan yachts. She follows them in lubricants, too—Gargoyle Marine Oils are used throughout.

Years of consistent use have proved to commercial owner and cruising yachtsman alike the outstanding advantages of these high-quality lubricants:

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NOTE: We will be glad to send you, without obligation, either of our authoritative books on Marine Lubrication: "Steamships with Reciprocating Engines," or "Marine Lubrication—Motorships." Address your request to: Vacuum Oil Company, Marine Sales Dept. D-11, 61 Broadway, New York City.

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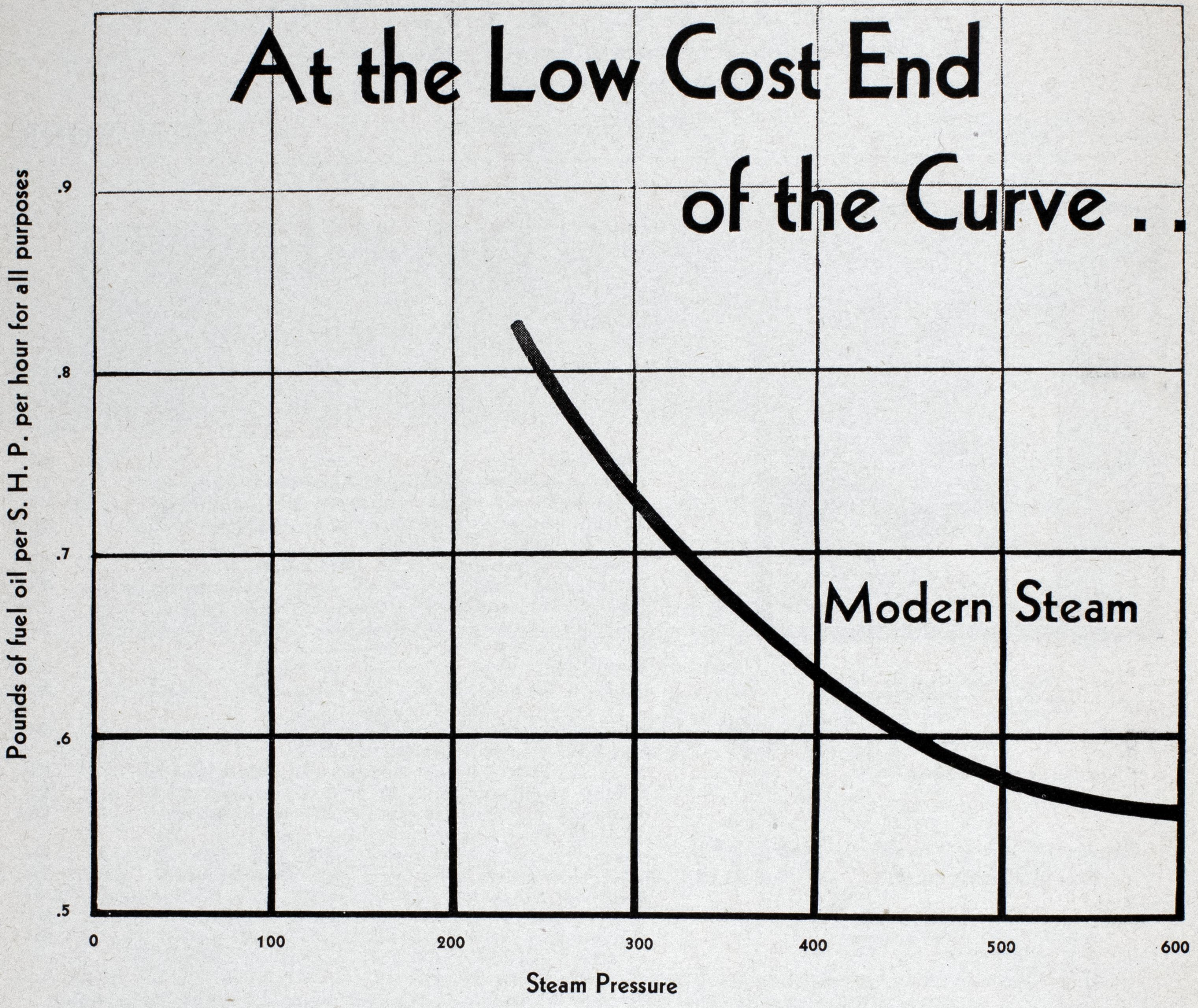
Vacuum Oil Company — *Specialists in the manufacture of high-grade lubricants for every class of machinery. Obtainable everywhere in the world* — New York, U. S. A.

At the Low Cost End of the Curve . . .



The above curve is shown to illustrate the savings possible through the use of Modern Steam. Naturally a graph as simple as this one must be approximate, and of use only in a comparative way to show relative values, since no account is taken of steam temperature or other variables which affect fuel consumption. The curve does show, however, the striking difference between Old Steam and Modern Steam as well as the possibilities for a further reduction in operating costs beyond those now realized aboard ship.

THE
BABCOCK & WILCOX
COMPANY

. . . . Modern Steam

The curve on the opposite page shows the approximate relation between steam pressure and fuel oil consumption. The upper and middle divisions of the curve were plotted from operating records of ships in service. The lowest oil consumption shown is based on the use of steam pressures and equipment similar to those in up-to-date stationary plants, but adapted to marine use.

Lowest Fuel Cost

Between the two extremes, at about .65 pounds of fuel oil per shaft horsepower per hour, there is a condition easily met with Modern Steam even in a ship of small size, such as one of 2000 horsepower. This oil consumption combined with the low cost of boiler fuel represents the lowest cost of fuel per S.H.P. per hour of any propulsion system now in use. Steamships are now in operation using less than this amount of fuel while others under construction are guaranteed to equal or better this performance.

True Economy

Ships using Modern Steam attain this economy with equipment of relatively low first cost, decidedly low repair and maintenance charges, of demonstrated reliability, and equipment that utilizes a wide variety of low priced fuels including Bunker C oil.

Further Possibilities

Modern Steam is not only showing the greatest true economy today but further economies are possible through the use of steam at pressures and temperatures higher than those adopted for marine service up to this time. No other propulsion system now in use holds such truly remarkable possibilities for further savings.

America Leads

That the United States Marine Industry leads the world in clear thinking on this subject is shown by a recent report of the American Bureau of Shipping covering the principal horsepower built or contracted for in this country during last year. Of all the ships of 2000 horsepower or over, more than 89% of the total power is steam. The propulsion systems for ships of this size are selected not by guess but only after careful and thorough analyses of operating costs including fixed charges on machinery and fuel costs per shaft horsepower per hour for all purposes.

The Babcock & Wilcox Company . . . 85 Liberty Street . . . New York

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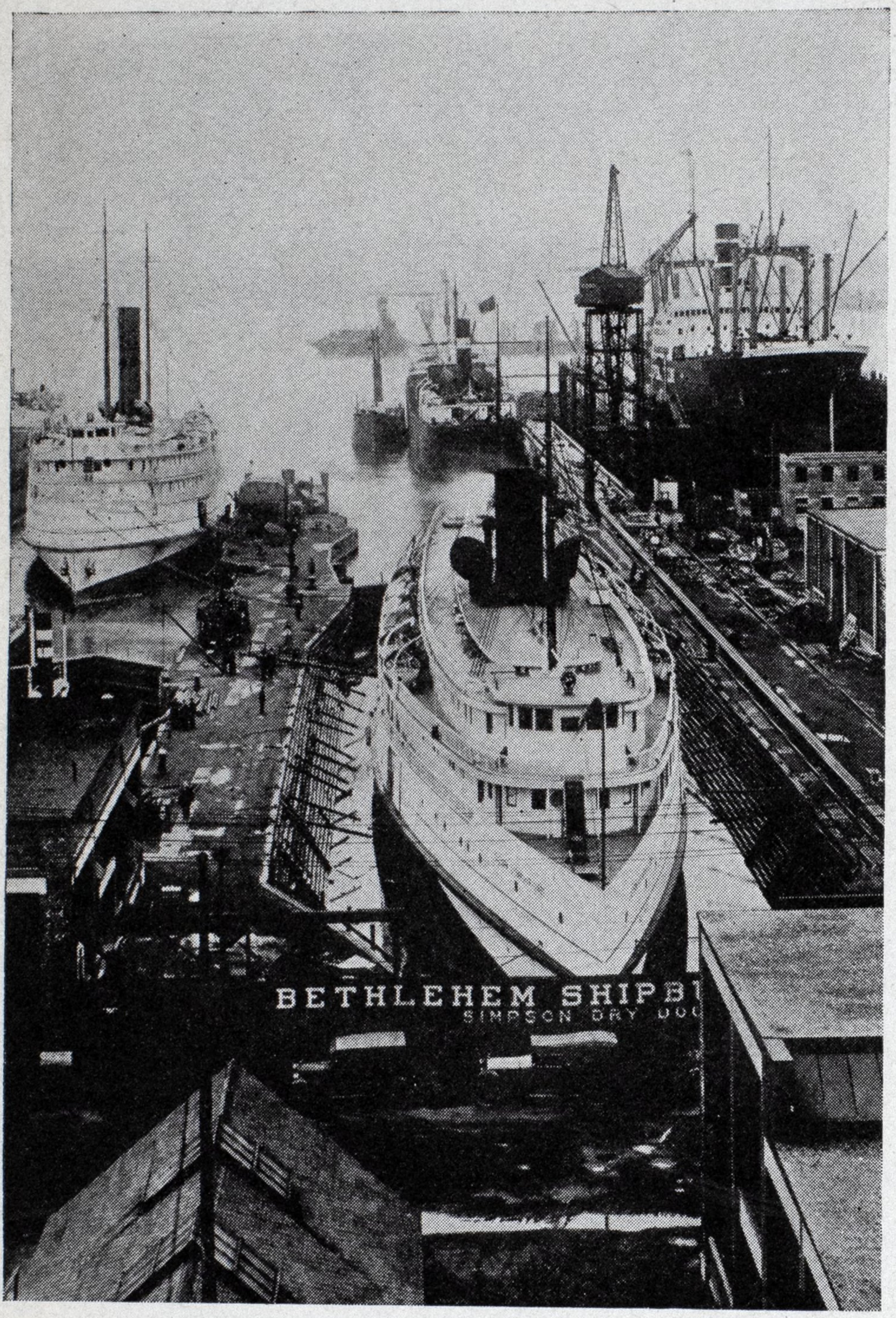

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Atlantic Works
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BALTIMORE HARBOR

Baltimore Plant

Baltimore Dry Docks Works
2 Graving Docks, 614 and 469 feet; 1 Floating Dry Dock 6000 tons

Sparrows Point Works
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Pacific Coast
(Union Plant)

SAN FRANCISCO HARBOR

Potrero Works
3 Floating Dry Docks 6,500, 2,500 and 2,000 tons

Hunter's Point Works
2 Graving Docks 1,020 and 750 ft.

Alameda Works
2 Marine Railways 4,000 and 2,000 tons

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The machinery which helps restore ships to service swiftly is equally capable of helping to put big industrial equipment back into shape. At each of American Ship's conveniently located ship yards, extensive repair resources are available for repairing, or building to your specifications, blast furnaces, rolling mills, cement mill machinery and other big industrial equipment.

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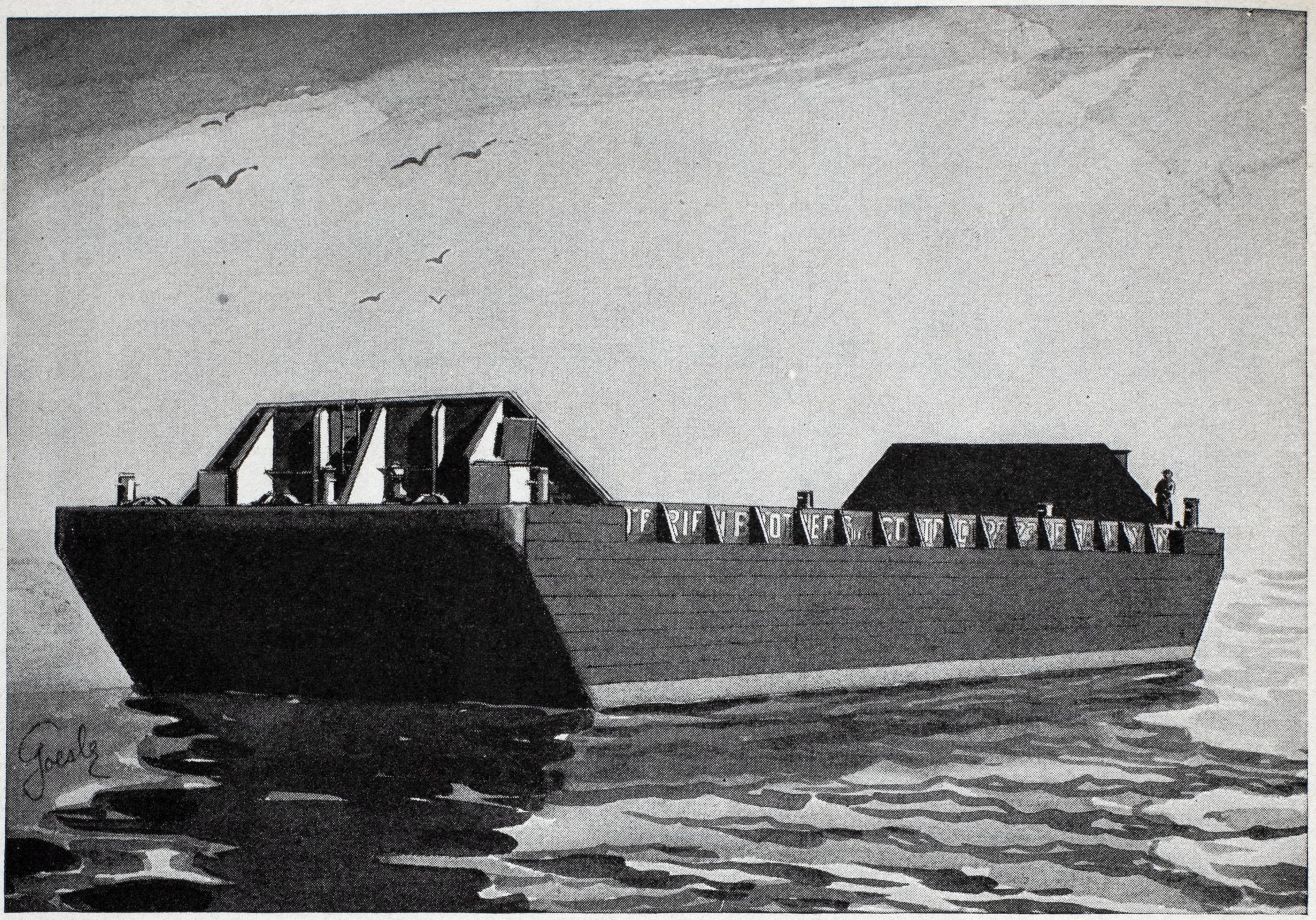
American Ship Building Co.	*American Ship Building Co.*	*Buffalo Dry Dock Company*	*Chicago Ship Building Co.*	*Superior Ship-building Co.*

FEDERAL BUILDS GOOD BARGES

FEDERAL WELDED BARGES



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Design adopted after several years investigation...Over 50 miles of welding performed on scows, oil barges and lighters of this design...75 per cent of the welding is done by automatic machinery, securing uniform and precise workmanship...Underwater surfaces doubly sealed by welding on outside and inside. Damage repairs simple, wherever hand welding is available.

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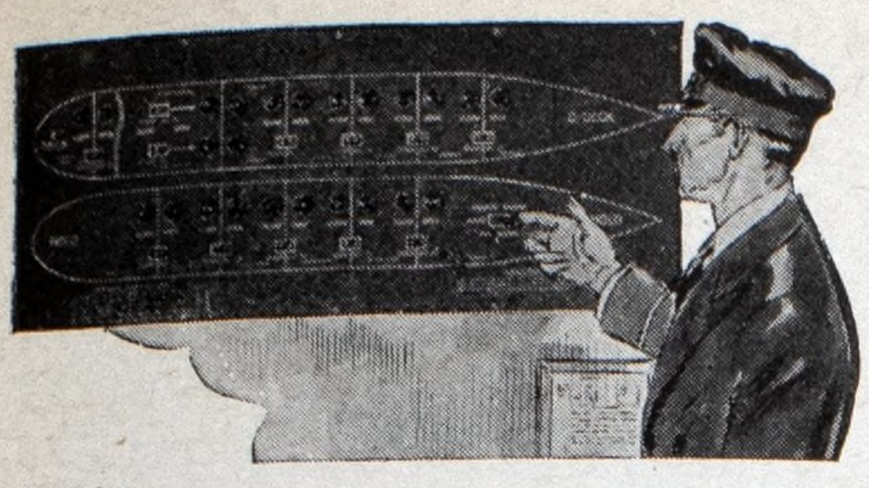
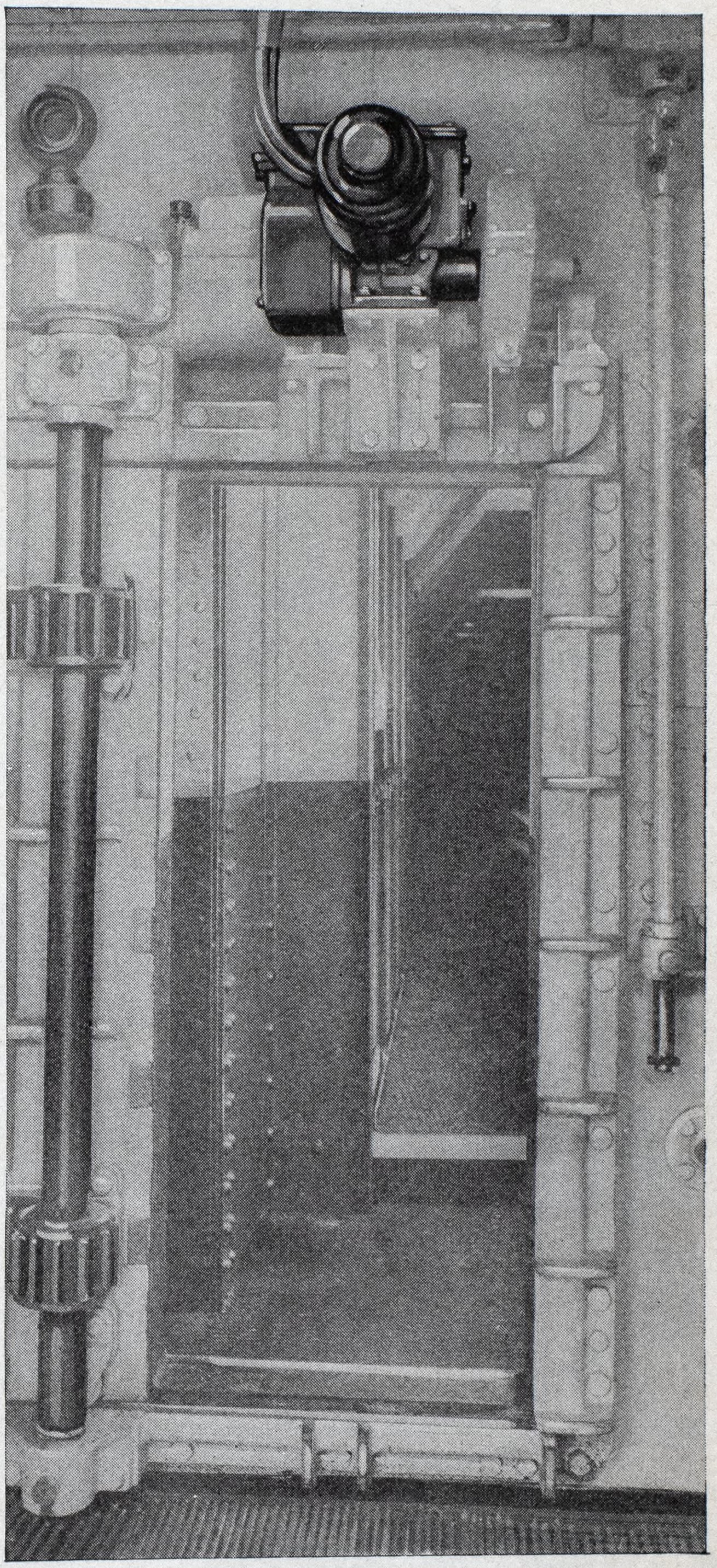


Not a Man Has Left His Post . . . Yet

Every Bulkhead IS CLOSED



On board the S. S. California, Panama-Pacific S.S. Co. Showing the compact, trouble-proof C-H Bulkhead Door Control Unit which closes and opens this horizontal watertight door.

MERELY throwing the switch on a master control panel in the pilot house now enables the officer in charge to close every bulkhead door—*within seconds.* He can close a single door or isolate an entire section. He never need take a man from his post; Cutler-Hammer Watertight Door Control does all the work—quickly, effectively. Yet C-H Control *permits* and *never interferes with* manual operation.

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Marine designers favor C-H Watertight Door Control because (1) it is a sea-going control system *built for the sea,* (2) it can easily be installed on new or rebuilt ships, (3) it easily meets every requirement of the International Conference on Safety of Life at Sea.

Every marine architect, designer and builder should have all the facts concerning the C-H Control System. Your request will receive prompt attention. "*Modern Watertight Door Control*" . . . a new Cutler-Hammer booklet, is sent free.

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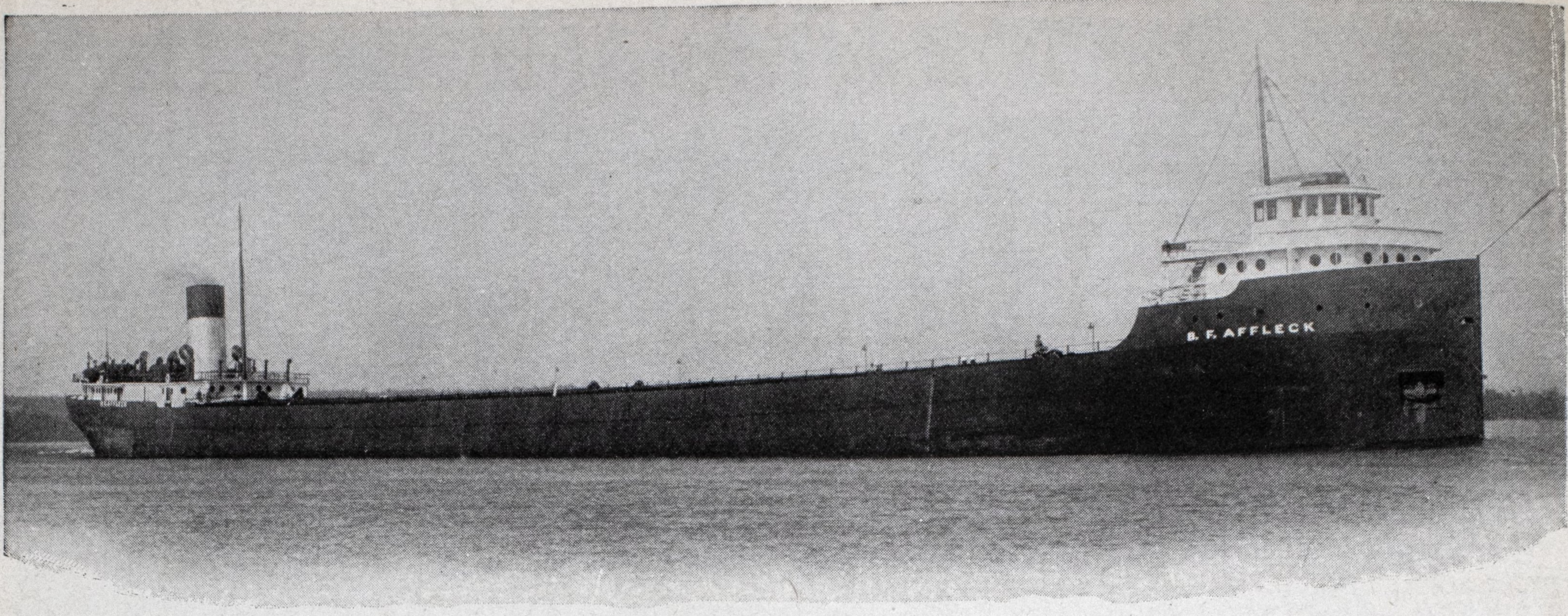
C-H

Motor-Driven Bulkhead Door Operating Systems

(A-320)



B. F. AFFLECK

Finest Type of Great Lakes Cargo Carrier

S.S. B. F. Affleck owned and operated by the Pittsburgh Steamship Company, is a single deck bulk cargo vessel of the standard type built for the iron ore, coal and stone trade of the Great Lakes. Her molded dimensions are: Length overall, 604 feet, length between perpendiculars, 580 feet; width 60 feet and depth 32 feet. Capacity 12,000 tons.

A diversified experience, covering the construction of all types of ships, fully qualifies us to meet *your* requirements thoroughly and with despatch.

Some Other Ships We Have Built

Auto Ferry, LA SALLE
Auto Ferry, ESSEX
Car Ferry, WABASH
Car Ferry, CHIEF WAWATAM
Car Ferry, ST. MARIE
Car Ferry, ANN ARBOR No. 5
Twin Screw Excursion Steamer, THOUSAND ISLANDER
Self Unloading, JOHN W. BOARDMAN

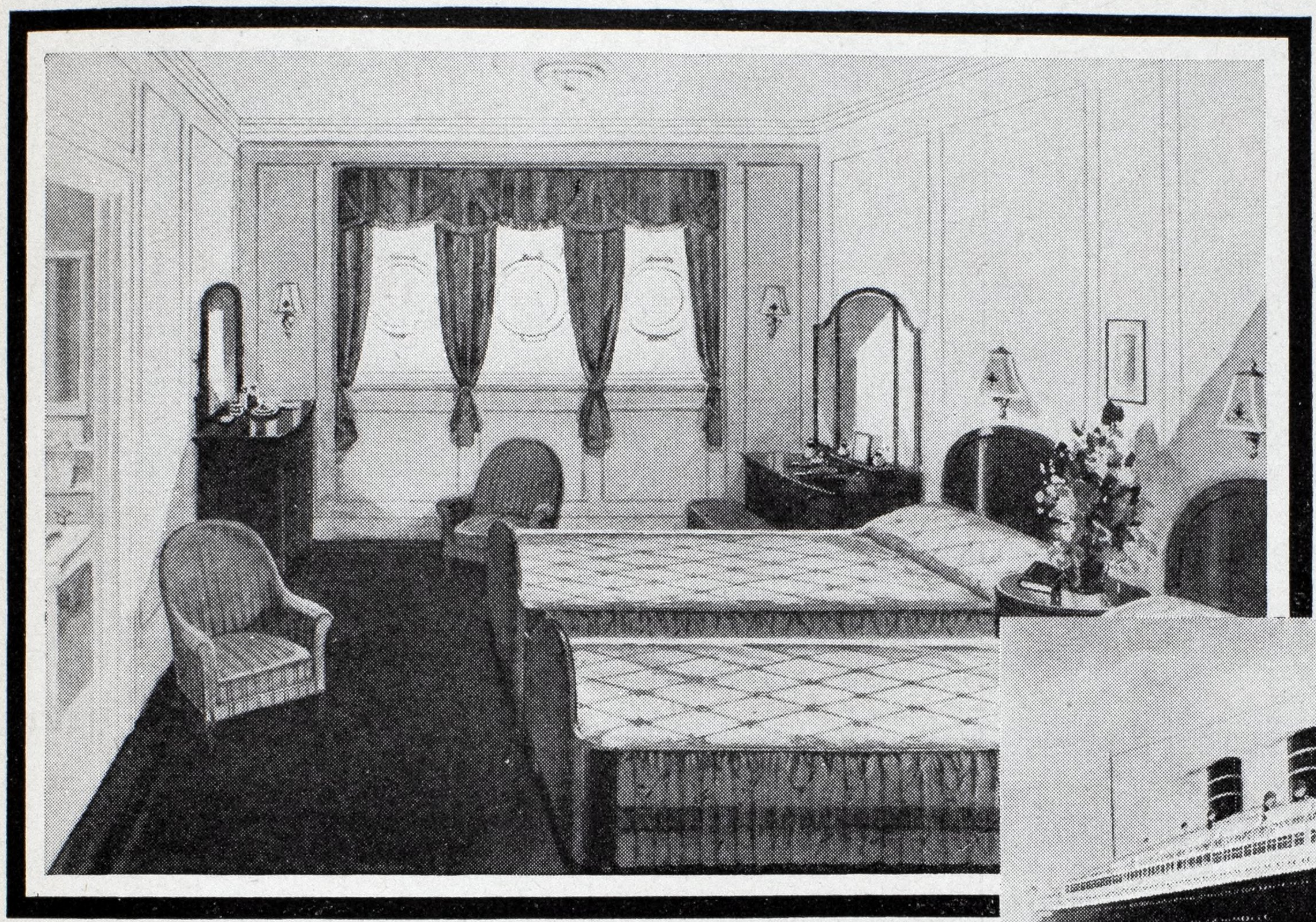
Toledo

Shipbuilding Company, Inc.

Toledo, Ohio

Under another Famous House Flag . . .

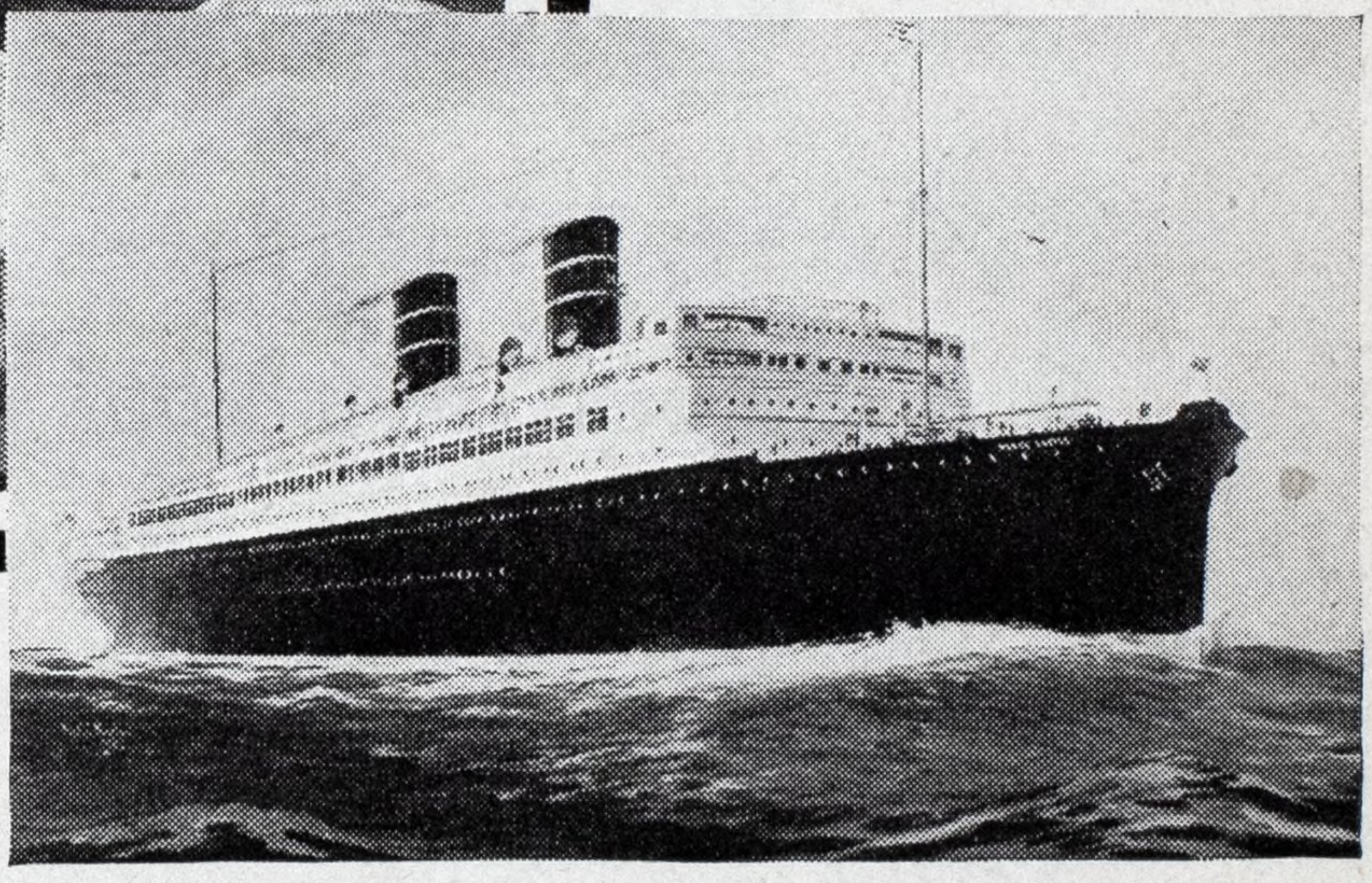
the Luxury of Simmons sleep equipment . .



All the comforts of home in these fine staterooms de luxe. Simmons metal beds, equipped with Simmons springs, and faithfully finished in the rich tones of costliest woods, add the final note of comfort and good taste.

•

The new Turbo-Electric Agwi Liners, "Morro Castle" and "Oriente," bring new lustre to the traditions of American shipping and credit to their owners — the Ward Line.



The "Morro Castle" and "Oriente" rival transatlantic liners . . .

PLYING between New York and Havana—these magnificent and speedy vessels of the Ward Line will cut twelve hours from the old running time, reducing it to a bare sixty hours.

Equipped to provide passengers with the supreme luxuries of ocean travel, not surpassed by even the great transatlantic liners, these splendid ships are a credit to the craftsmanship and designing skill of American builders.

Decks are spacious playgrounds—the public saloons richly and tastefully appointed. To the last detail—every luxury of ocean travel is provided.

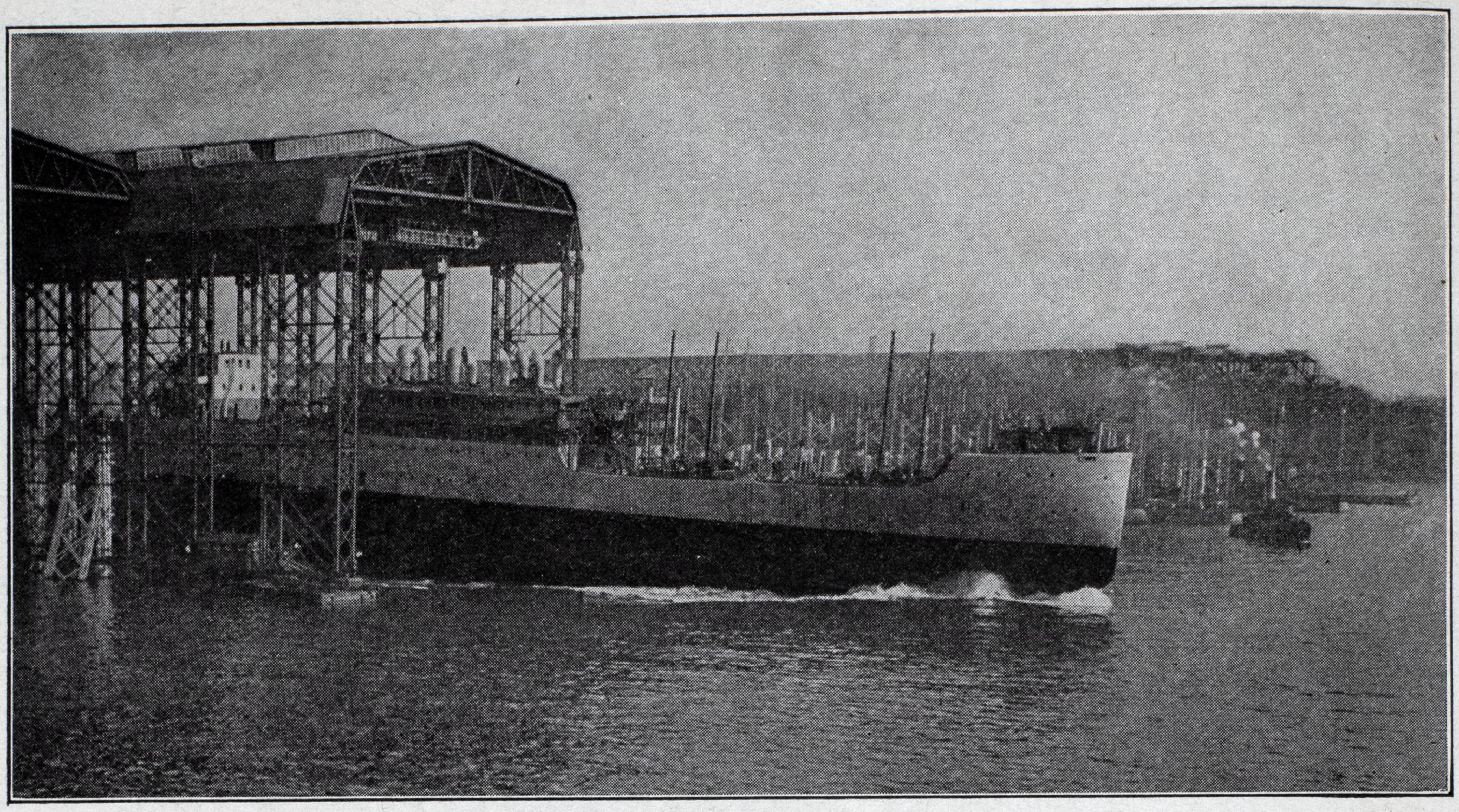
And in the staterooms — Simmons beds of graceful design, equipped with supremely comfortable Simmons Springs—lend the final touch of beauty and comfort so essential in modern ocean travel.

With an unsurpassed record of marine installations, Simmons Company has a background of experience that is yours to call upon. Write to Simmons Company — Contract Division — 666 Lake Shore Drive, Chicago, Illinois.

SIMMONS

BEDS · SPRINGS · MATTRESSES · METAL FURNITURE AND BERKEY & GAY FURNITURE

NEW YORK SHIPBUILDING COMPANY



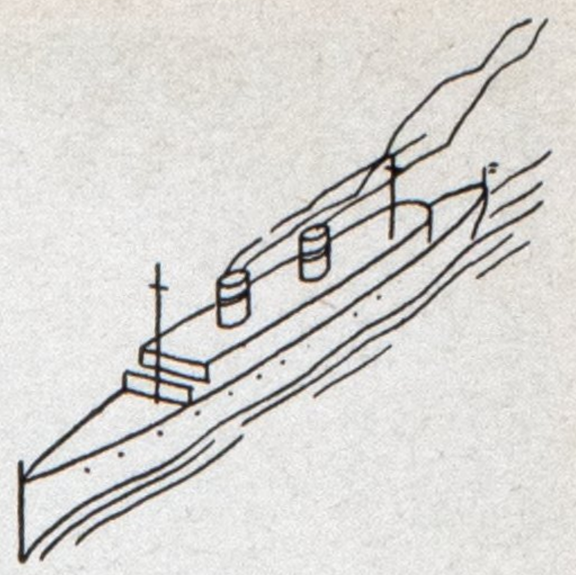
A Plant and Organization that have Served the Government and Private Owners for Thirty Years

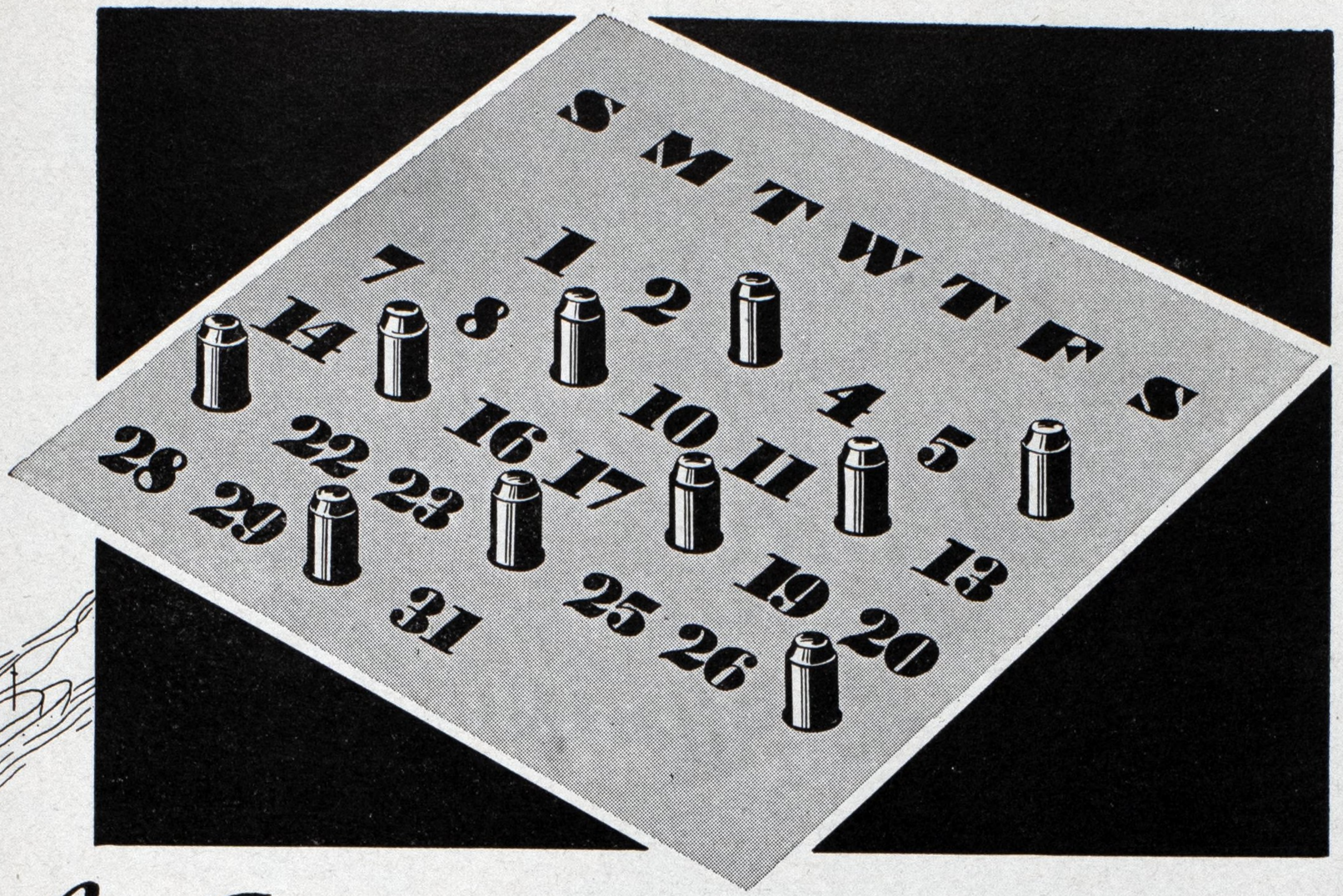
IN every industry there are those who excel—their product is the best of its kind and their name is a guarantee of superiority. New York Shipbuilding Company, a veteran of pre-war days, has contributed to America's Merchant and Naval Marine a large quota of this Country's most successful ships. Competent design and workmanship have been combined in every detail of each vessel. The name has become a symbol of craftsmanship.

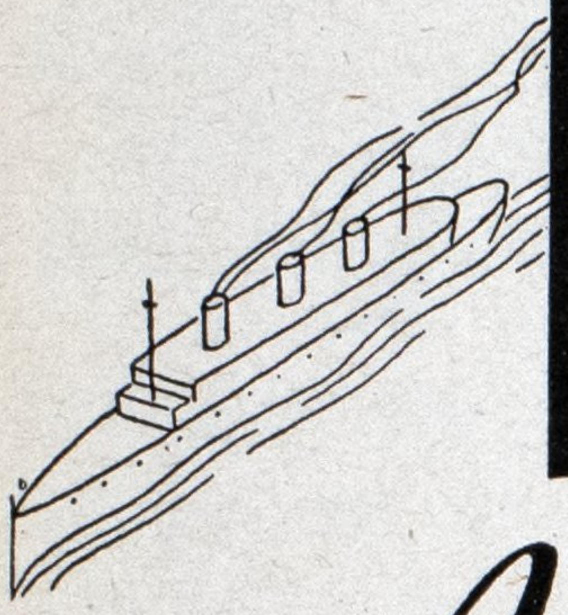
We invite operators and owners to make a detailed comparison of vessels built at this yard with similar ships of the same age built elsewhere.

NEW YORK SHIPBUILDING CO.

Main Office and Works: Camden, N. J. New York Office: 420 Lexington Ave.



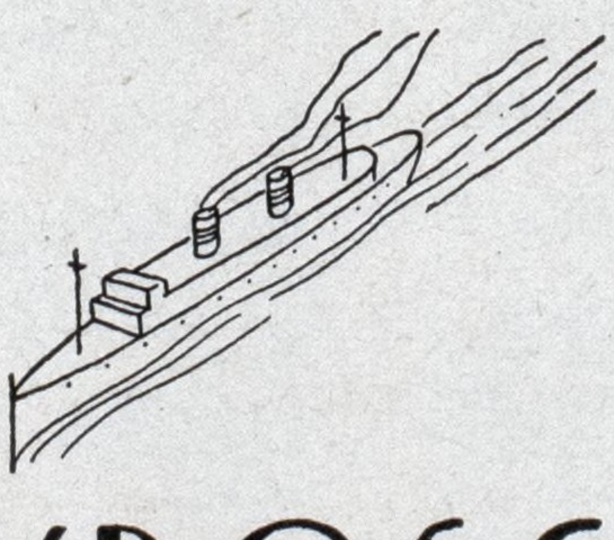




A Sperry Gyro-Compass
EVERY THIRD DAY

Every third day, in some port of the world, there is a merchant vessel fitted with a Sperry Gyro-Compass.

Whether this modern compass is installed on a vessel flying the flag of the United States, Belgium, Canada, Chile, Denmark, England, France, Germany, Holland, Italy, Japan, Norway, Spain or Sweden, it speaks but one language, understandable to all, "True North with dependability," which means INCREASED SAFETY AND OPERATING EFFICIENCY.



SPERRY GYROSCOPE CO., INC.

BROOKLYN, NEW YORK

CLEVELAND
414 Rockefeller Bldg.

LOS ANGELES
236 Avalon Blvd., Wilmington

SAN FRANCISCO
58 Main Street

SEATTLE
2737 1st Avenue, South

SPERRY

NOW 1,500 VESSELS are serviced by RCA

REMARKABLE GROWTH OF RADIOMARINE SERVICE

For many years, Radiomarine Service has been the leader in its field—a deserved position because of its progressive policies.

Radiomarine Corporation of America benefits by vast research, engineering and manufacturing facilities. Hence, Radiomarine Service offers the world's greatest system for shore to ship communication. A service which enables owners and agents to keep in constant touch with their vessels. Owners and navigators declare that Radiomarine Service is today's greatest single factor for increased safety at sea. It enables every ship to combat storm conditions better . . . fog, rain, snow, sleet or wind.

Radiomarine coastal stations are located at the following points:

Chatham, Mass.
New London, Conn.
East Moriches, L. I.
New York, N. Y.
Tuckerton, N. J.
Baltimore, Md. (city station)
Palm Beach, Fla.
Galveston, Tex.
Port Arthur, Tex.
Buffalo, N. Y.
Cleveland, Ohio
Chicago, Ill.
Duluth, Minn.
Los Angeles, Cal.
San Francisco, Cal.

Unsurpassed in efficiency—vastly more than simply a sales organization for equipment—Radiomarine Corporation of America offers a complete and reliable service to every ship owner and navigator.

Note some of these features briefly outlined here. Then you, too, will realize better why Radiomarine Service has won supremacy.

Complete RCA Service includes

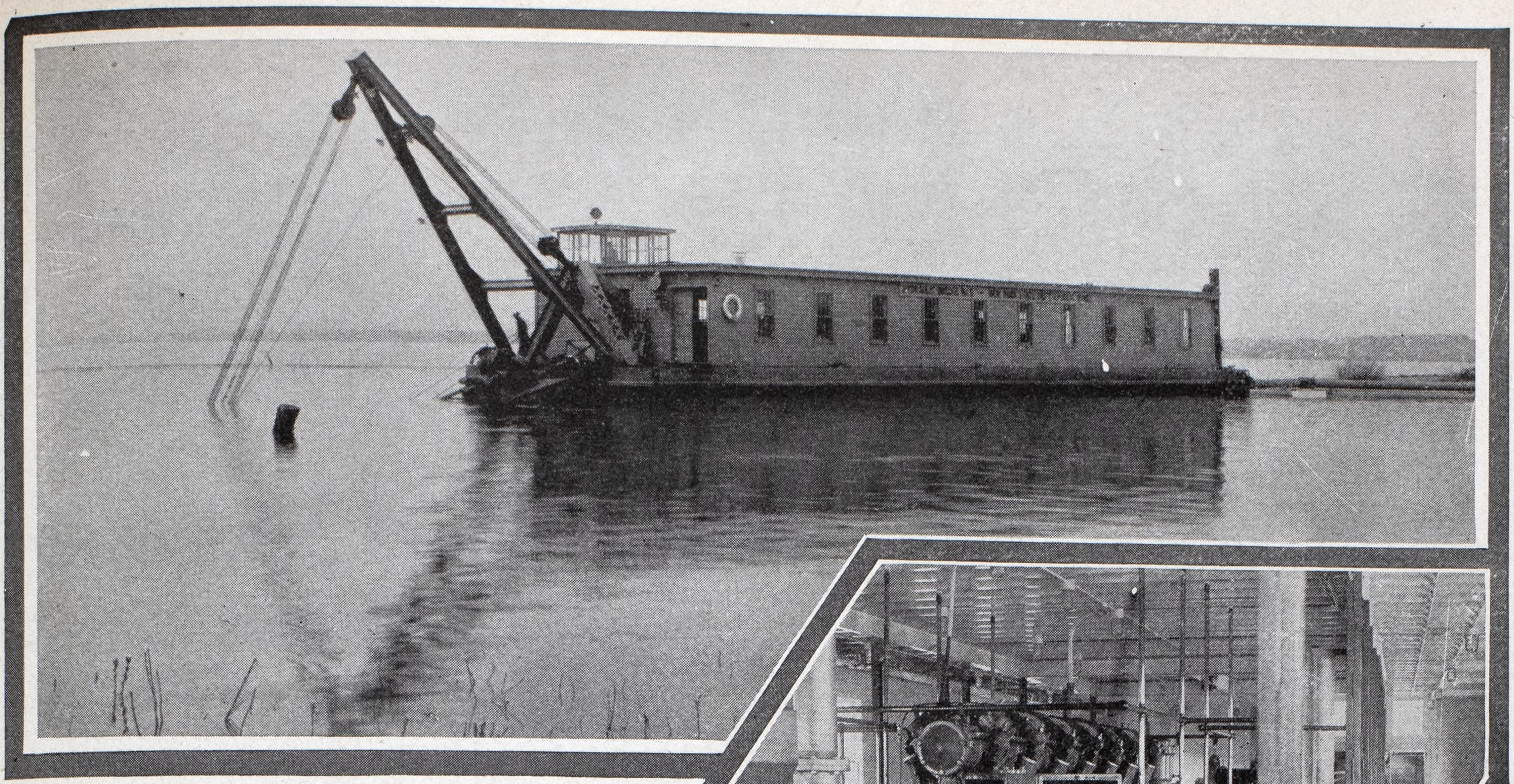
1. *Equipment*—transmitting and receiving equipment of the vacuum tube type; radio direction finder.
2. *Service on equipment*—regular inspections at any of seventeen ports; maintaining at principal ports stocks of spare parts for repairs and renewals.
3. *Operators*—detailing of experienced operator personnel to the ships.
4. *Coastal Stations*—Maintenance of fifteen coastal stations on the Atlantic, Pacific, Gulf and Lakes, for prompt, efficient handling of radio traffic.
5. *Accounting*—Checking and settling of accounts.
6. *Licenses*—Procuring of government licenses.

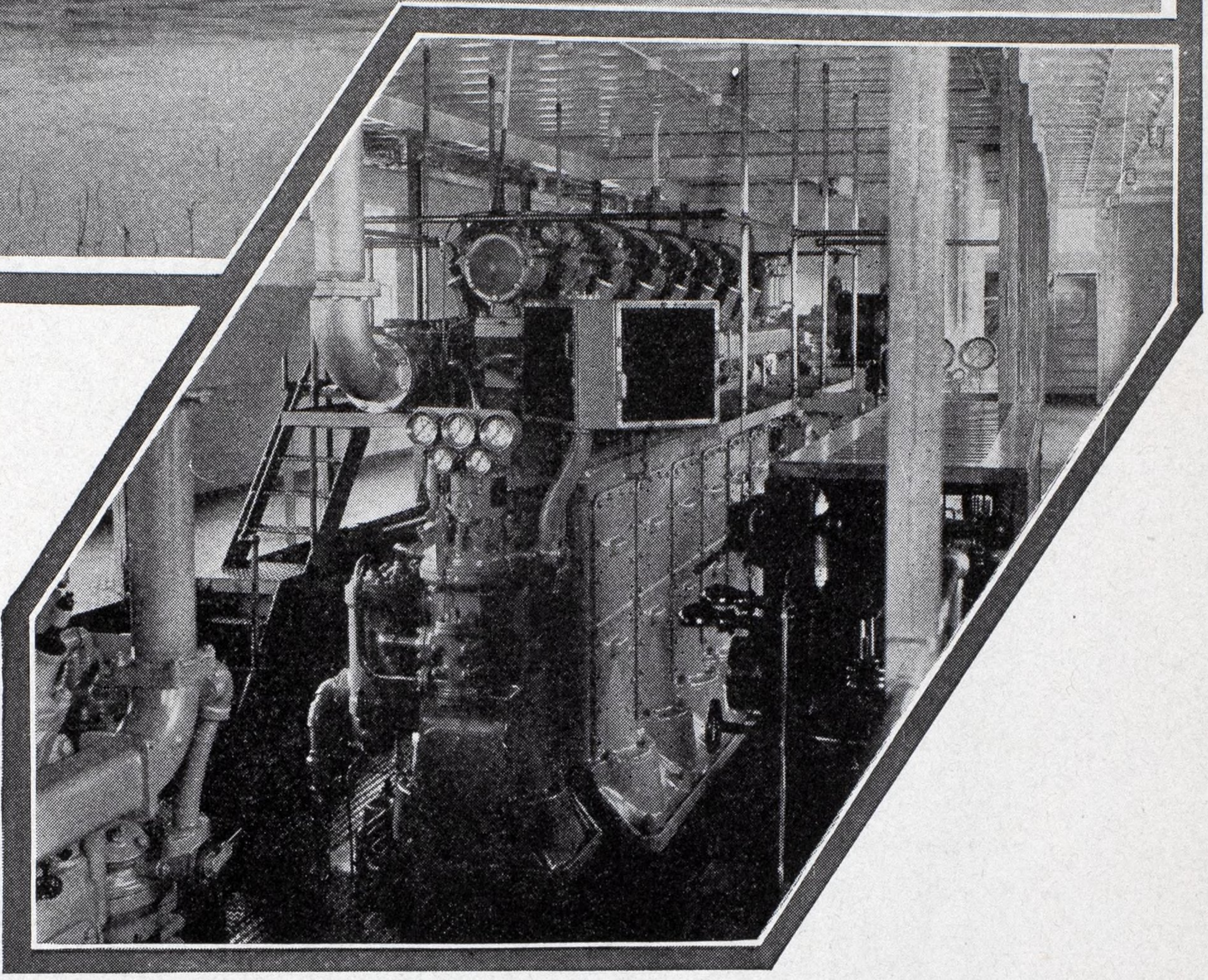
Radiomarine storerooms and service stations in charge of radio men of long experience are located at the following ports:

Boston
New York
Philadelphia
Baltimore
Norfolk
Savannah
New Orleans
Galveston
Port Arthur
Buffalo
Cleveland
Chicago
Duluth
Los Angeles
San Francisco
Seattle
Honolulu

RADIOMARINE CORPORATION OF AMERICA
66 BROAD STREET
NEW YORK

A subsidiary of the Radio Corporation of America





State of New York
Dept. of Public Works
Hydraulic Dredge No. 5

◆

Six-cylinder 500 B.H.P. Lombard-Diesel direct connected to 15″ Morris Machine Works dredge pump, and four-cylinder 150 B.H.P. Lombard-Diesel direct connected to 100 K.W. General Electric generator.

◆

.386 lbs. Fuel per B.H.P.

A definite example of the economy of Lombard-Diesels is the low fuel consumption of .386 lbs. per brake horsepower per hour on the official tests of this 500 B.H.P. 275 R.P.M. dredge pump engine.

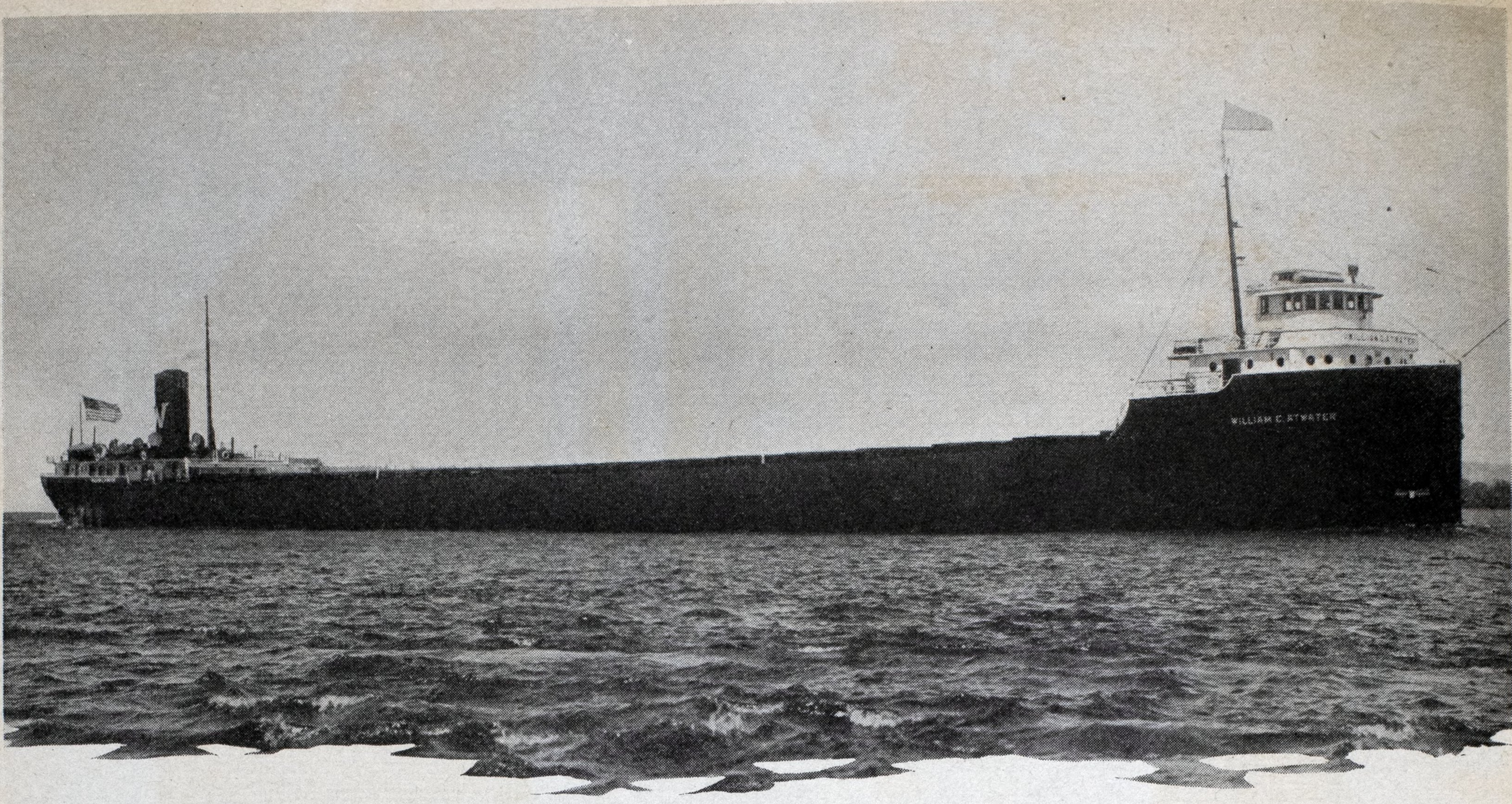
High efficiency is an attribute of these engines. It obtains in everyday service as well as on official tests. It obtains with moderate fuel and combustion pressures and with a large reserve in engine capacity. For example, this 500 B.H.P. engine was loaded to 600 B.H.P. and the exhaust was clear at all loads.

Such performance, and the advanced engineering and mechanical excellence of Lombard-Diesels, assures the *continued high efficiency* which means reliability, low upkeep, and long life.

THE LOMBARD GOVERNOR COMPANY, ASHLAND, MASS.

LOMBARD-DIESEL

AIR-INJECTION FOUR-CYCLE



----AGAIN A LEADER!----------

FOR THE FIFTH CONSECUTIVE YEAR A WILSON TRANSIT CO. STEAMER BUILT BY GREAT LAKES ENGINEERING WORKS HAS CARRIED THE GREATEST AMOUNT OF FREIGHT THROUGH THE CANAL AT SAULT STE. MARIE

Following are the records since 1925 in which year the total freight carried by a steamer exceeded 550,000 tons for the first time:

1925	James MacNaughton	554,100 Net Tons
1926	Wm. C. Atwater	442,107 ,, ,,
1927	James MacNaughton	554,978 ,, ,,
1928	Wm. C. Atwater	487,888 ,, ,,
1929	Wm. C. Atwater	557,020 ,, ,,

GREAT LAKES ENGINEERING WORKS

Shipbuilders and Engineers

General Offices

River Rouge, Michigan

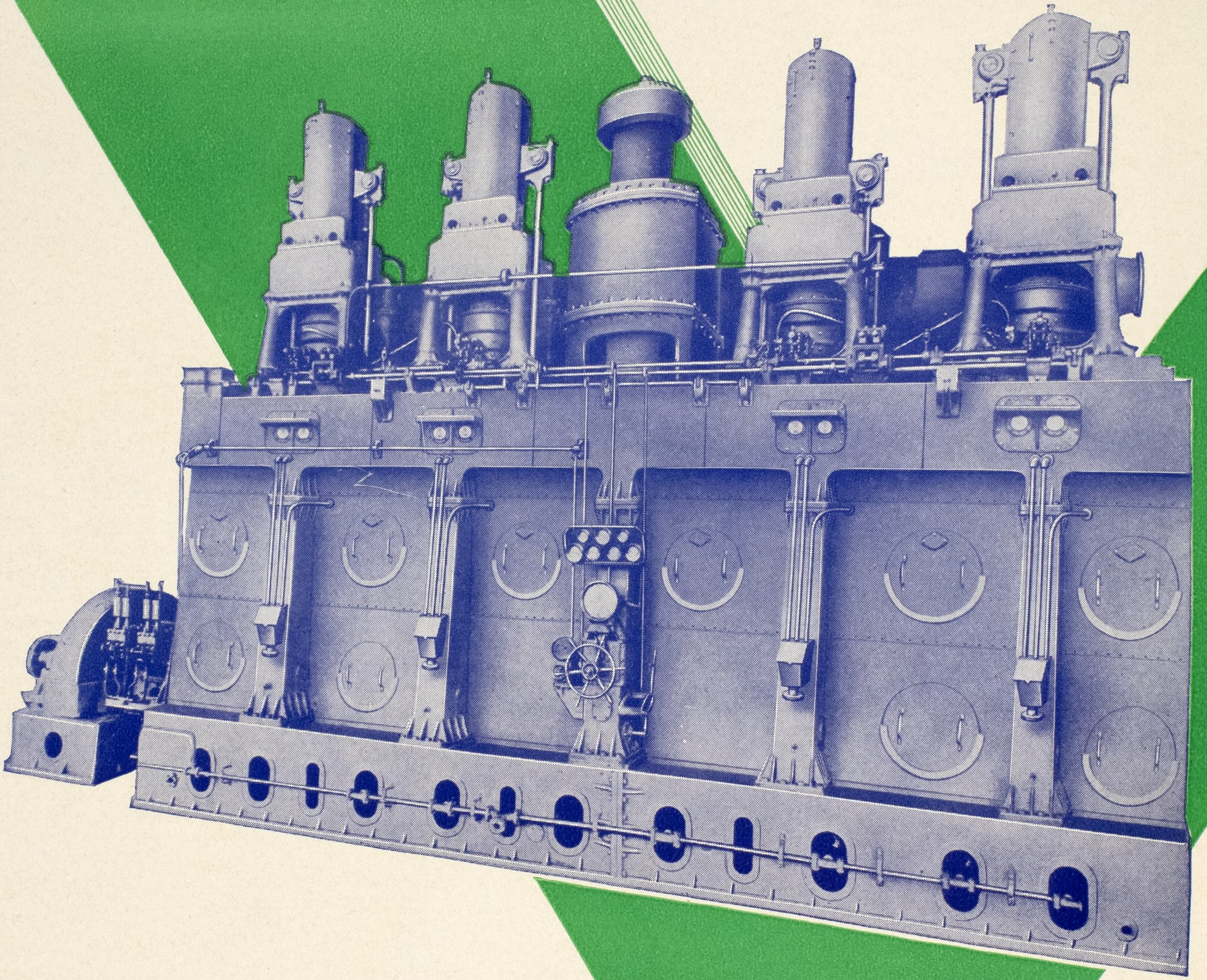
Cleveland Office: Union Trust Bldg.

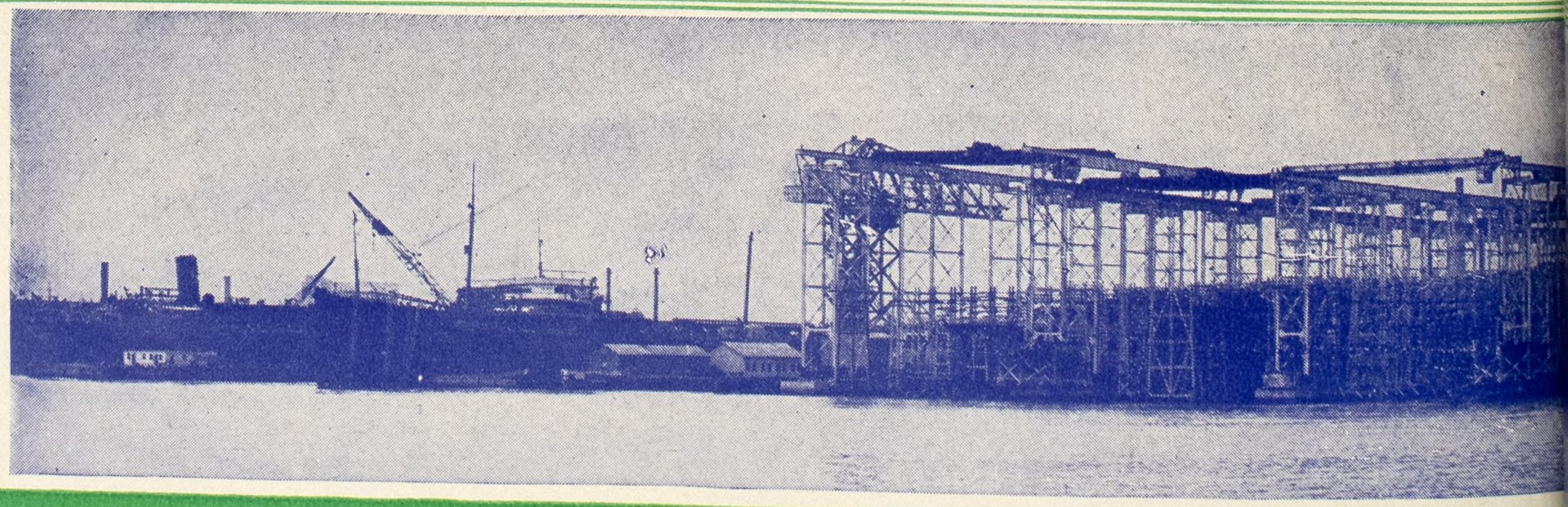
Engine Works Equipped For General Heavy Machine and Foundry Work
Detroit, Michigan

Complete Shipbuilding Dry Dock and Repair Facilities
River Rouge, Mich., and Ashtabula, Ohio

Power with Efficiency

are the Fundamentals of the



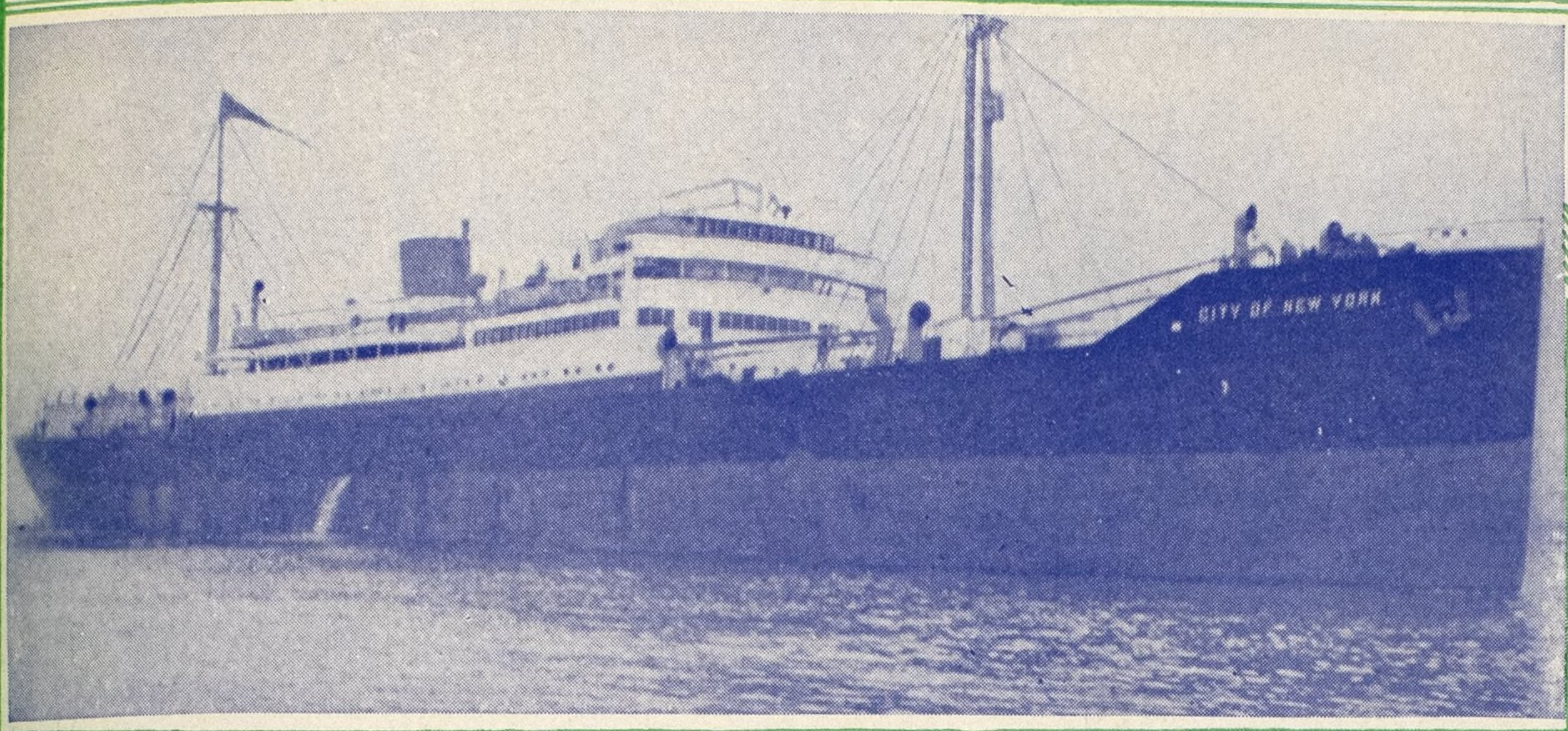


BUILDERS OF ALL TYPES OF VESSELS

SUN SHIPBUILDING &

SHIPYARD & MAIN OFFICE · · CHESTER, PA.

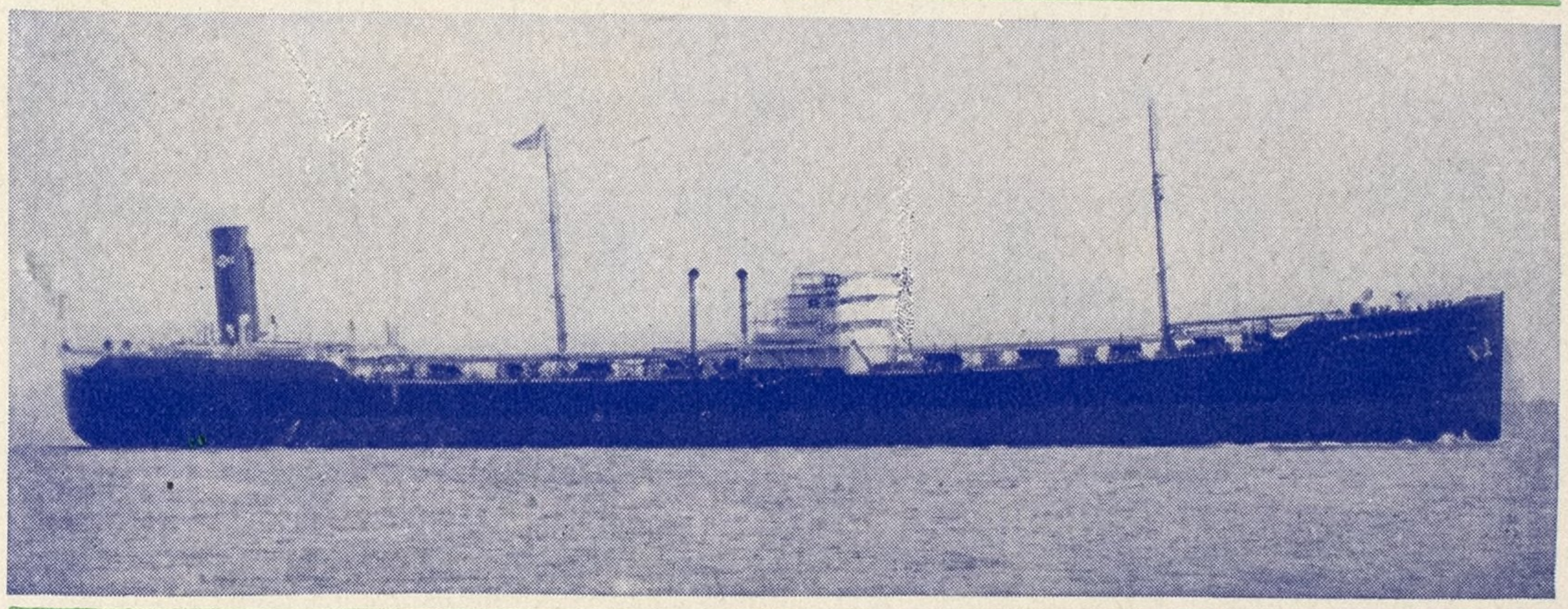
OPPOSED PISTON SUN-DOXFORD TWO CYCLE DIESEL ENGINE



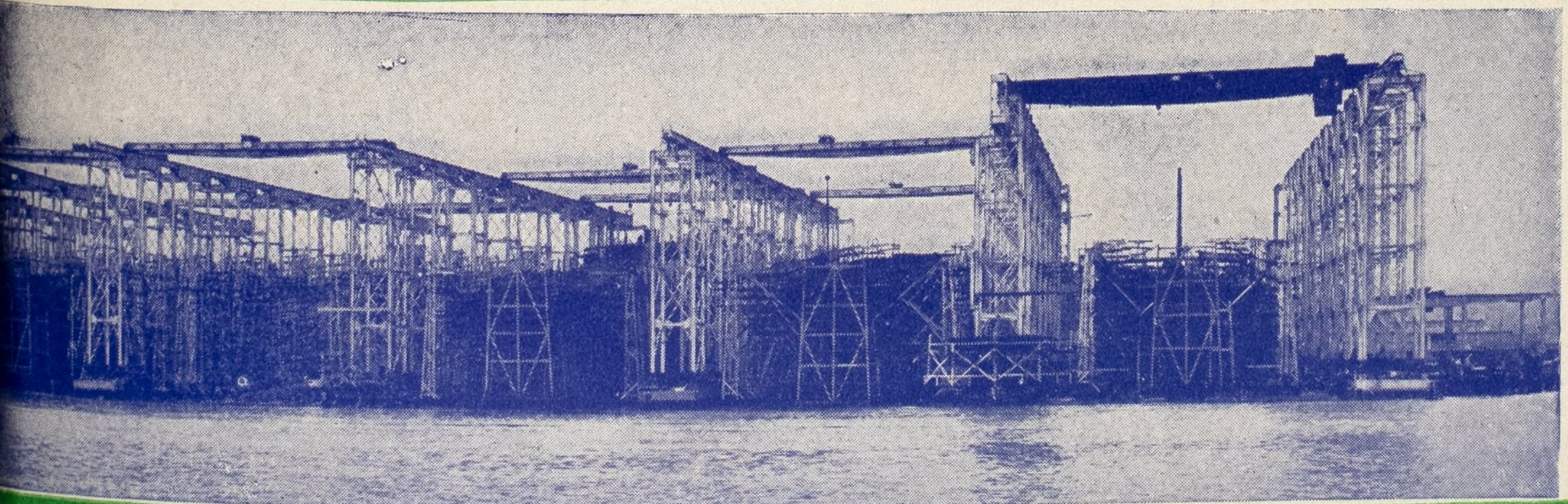
MOTORTANKERS	h.p.	d.w.t.
Aurora	3,000	10,200
Australian (twin screw)	5,000	17,120
Bidwell	3,000	10,200
Chester Sun	2,800	13,452
Eastern Sun	3,000	13,500
Gulf of Venezuela	3,000	10,200
Pacific Sun	3,000	13,500
Sun	3,000	13,500
Sunoil	3,000	13,500
Tide Water	3,000	13,800
Tide Water Associated	3,000	13,800
Western Sun	3,000	13,500

SEVENTEEN large American vessels and one pleasure yacht are now equipped with American Built Sun-Doxford Diesel Engines.

MOTORSHIPS (Passenger and Cargo)	h.p.	d.w.t.
Benson Ford	3,000	12,000
Challenger	3,000	11,600
City of New York (twin screw)	5,400	9,350
East Indian (twin screw)	5,000	11,600
Henry Ford II	3,300	12,000
Twin-Screw Yacht Sialia	1,500	



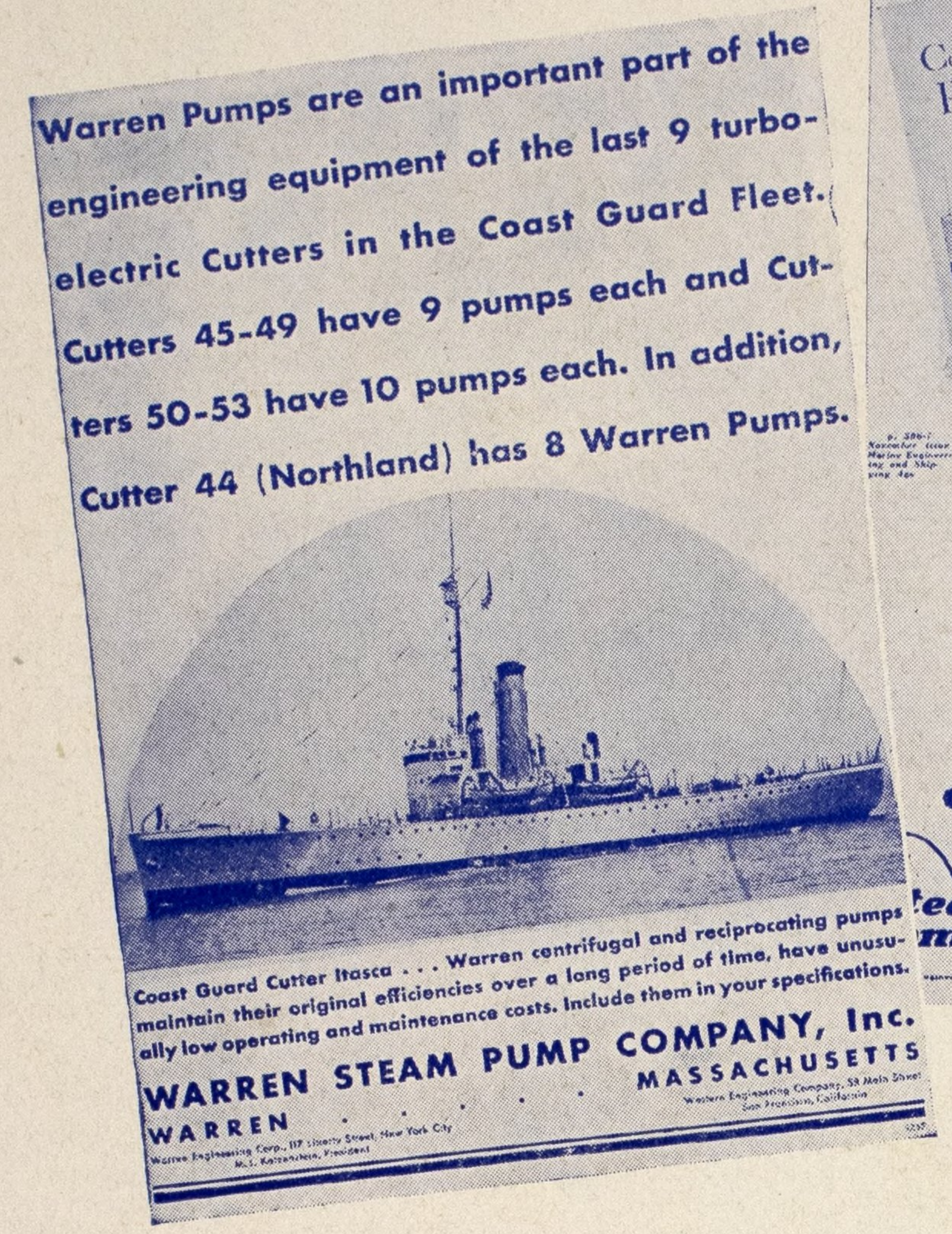
Illustrated at the top is the motorship City of New York; below, the motortanker Australian.

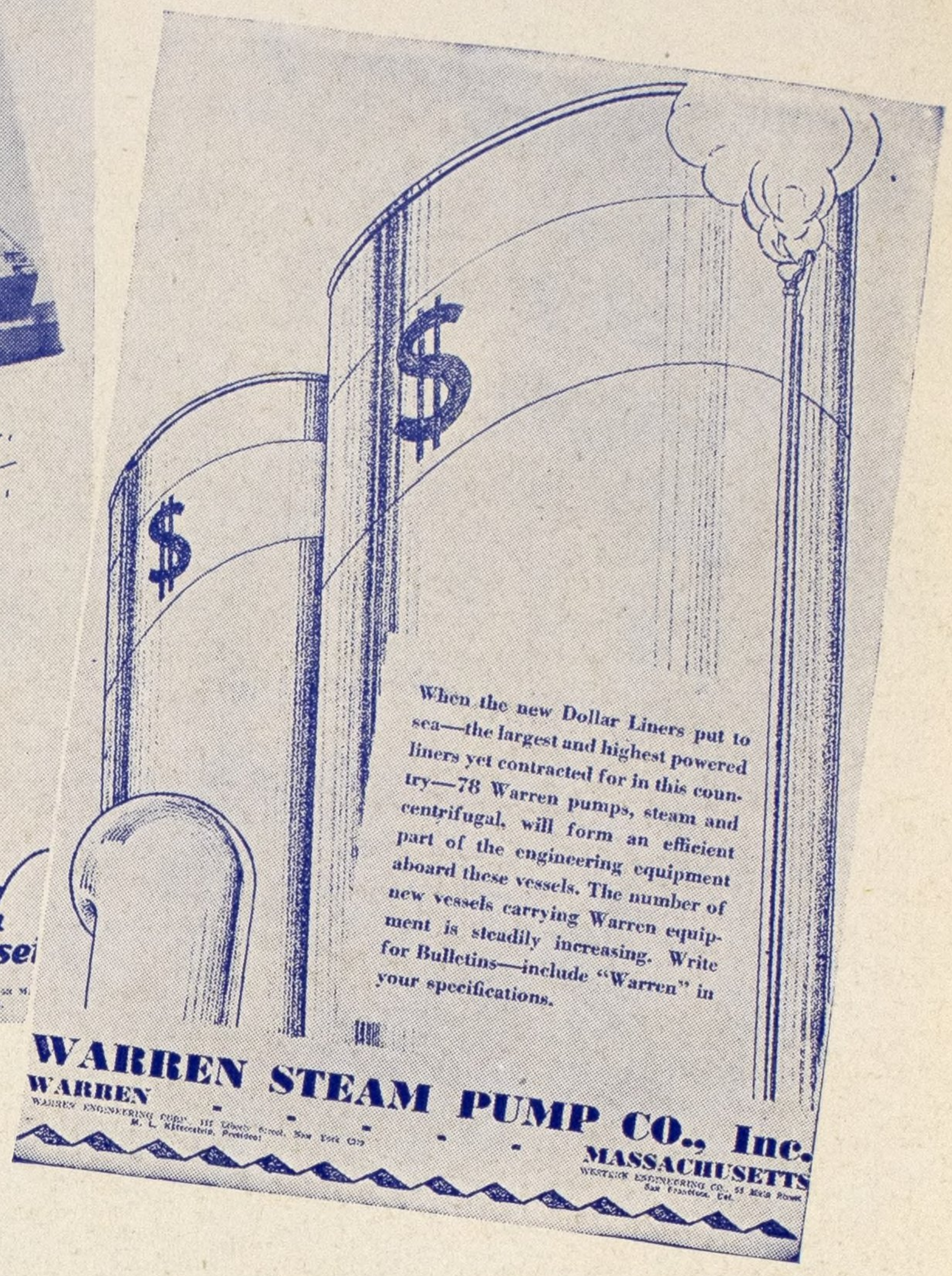


DRY DOCK COMPANY

816 CUNARD BUILDING · 25 BROADWAY, N.Y.C.

DRYDOCKING and REPAIRS





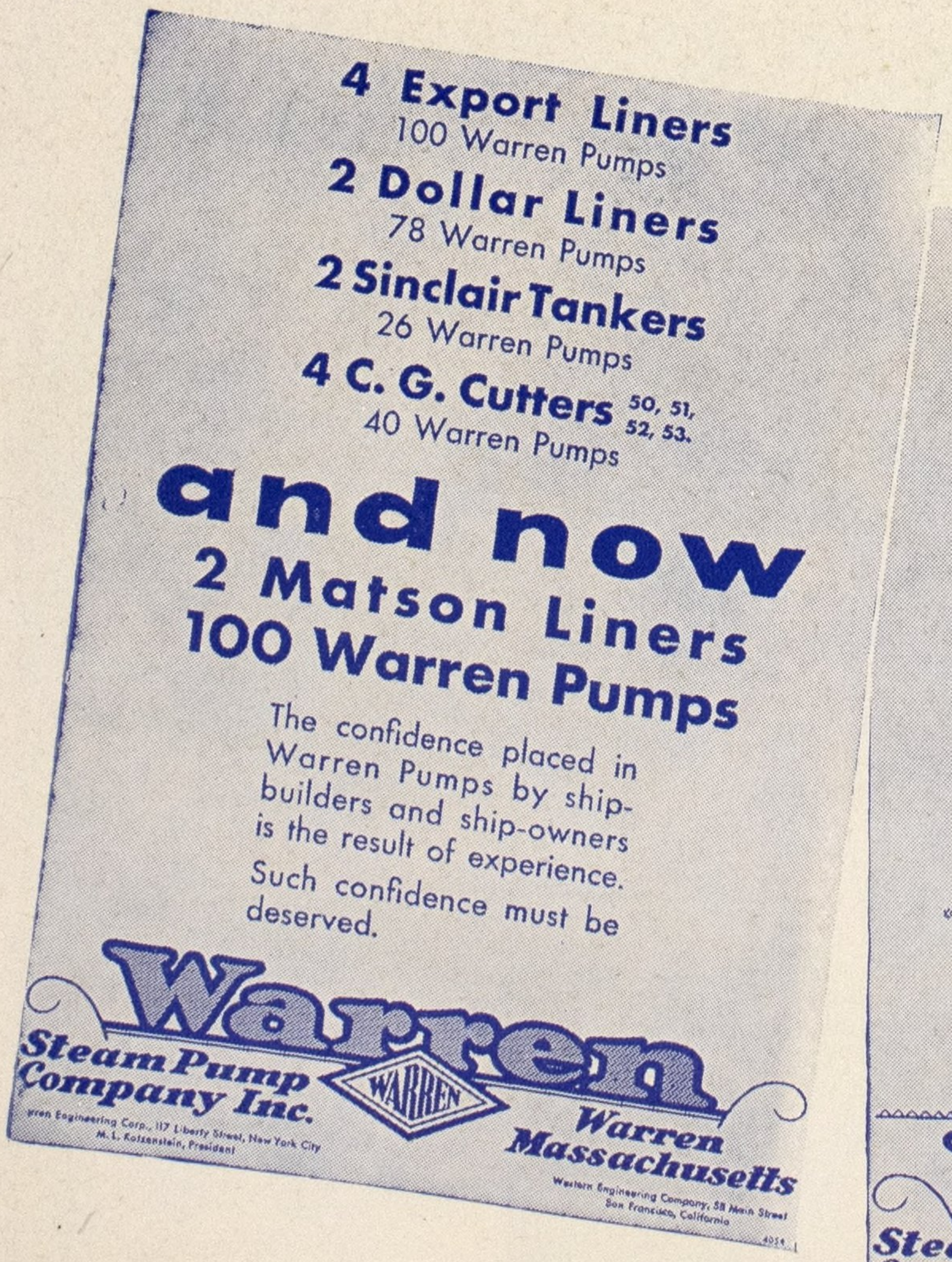
The fact that these notable ships are equipped with Warren pumps is less interesting than the reason why. Past performance and sound engineering design have resulted in a decided preference by engineers, builders, and owners for the economical, dependable service delivered by Warren equipment. Centrifugal and reciprocating pumps for every purpose; include "Warren" in your specifications.

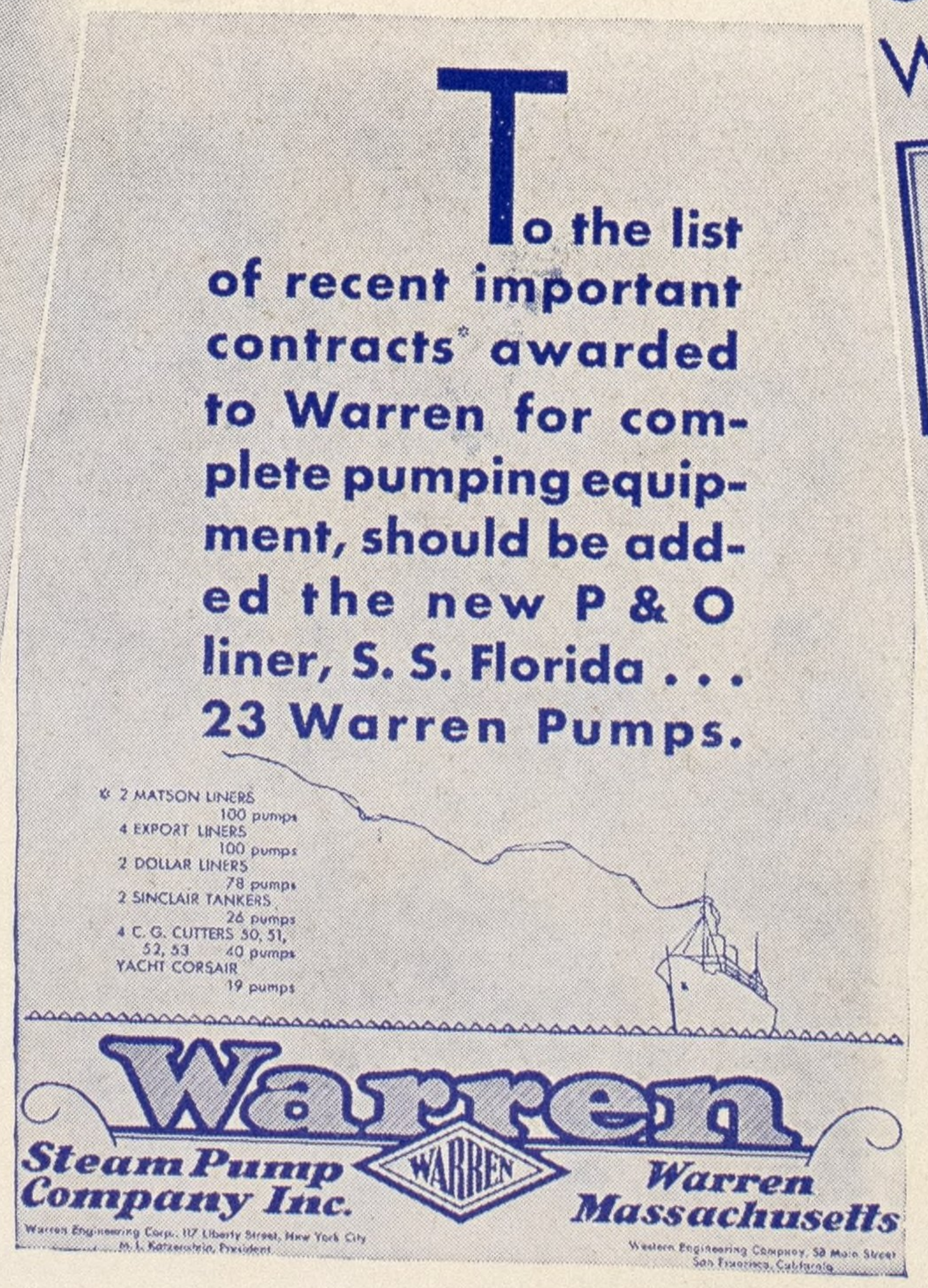
WARREN STEAM PUMP COMPANY, Inc.

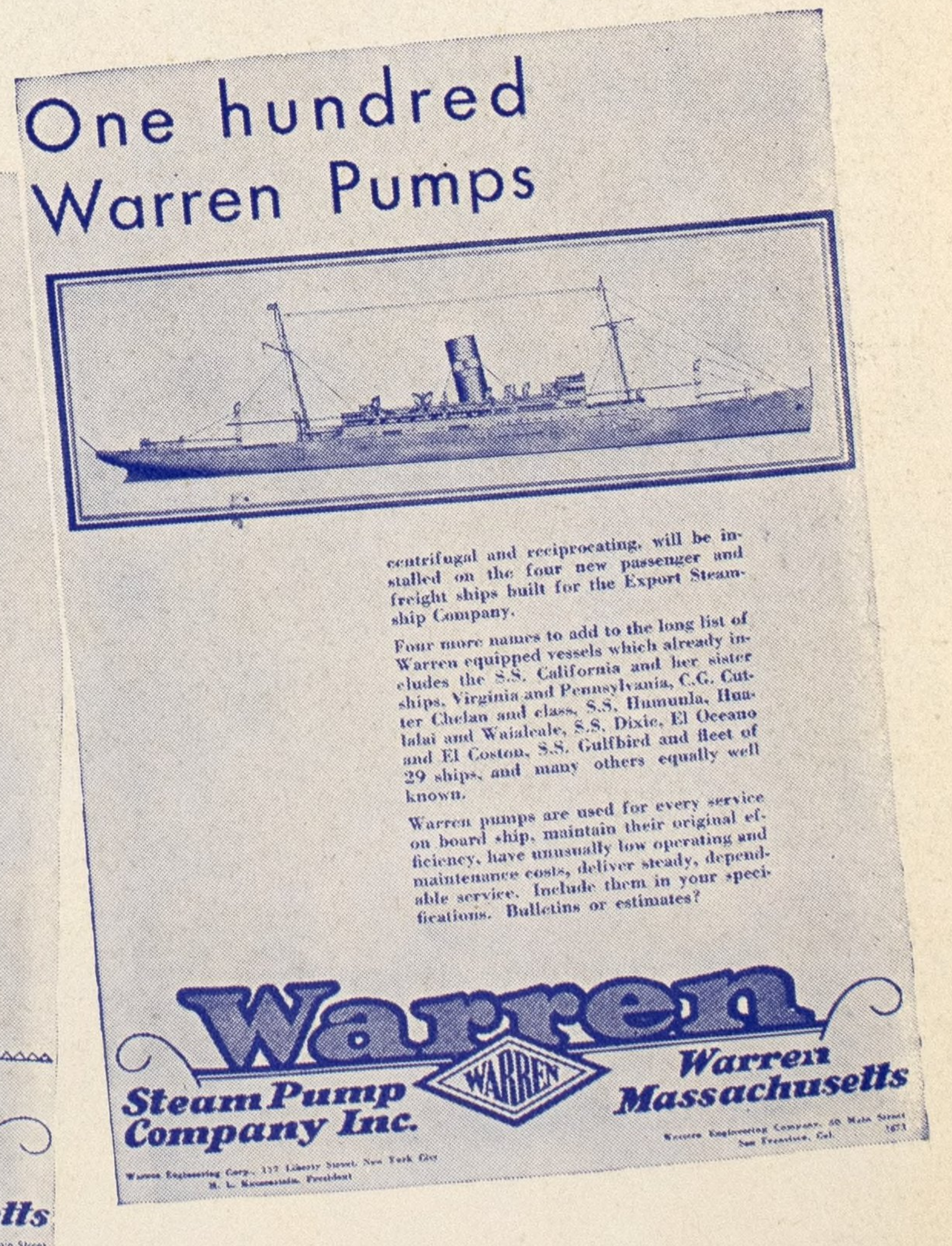
Warren — **Massachusetts**

Warren Engineering Corporation
117 Liberty St., New York
M. L. Katzenstein, President

Western Engineering Company
58 Main St., San Francisco, Cal.







Steel Forgings *and* Steel Castings For Ships

- Propeller Shafts
- Line Shafts
- Thrust Shafts
- Generator Shafts
- Turbine Forgings
- Rudder Stocks
- Diesel Engine Crankshafts
- Piston Rods
- Connecting Rods
- Cast Steel Propellers
- Barge and Dock Castings
- Engine Pump, and Compressor Castings

Carbon or Alloy Steel
Basic or Acid Process

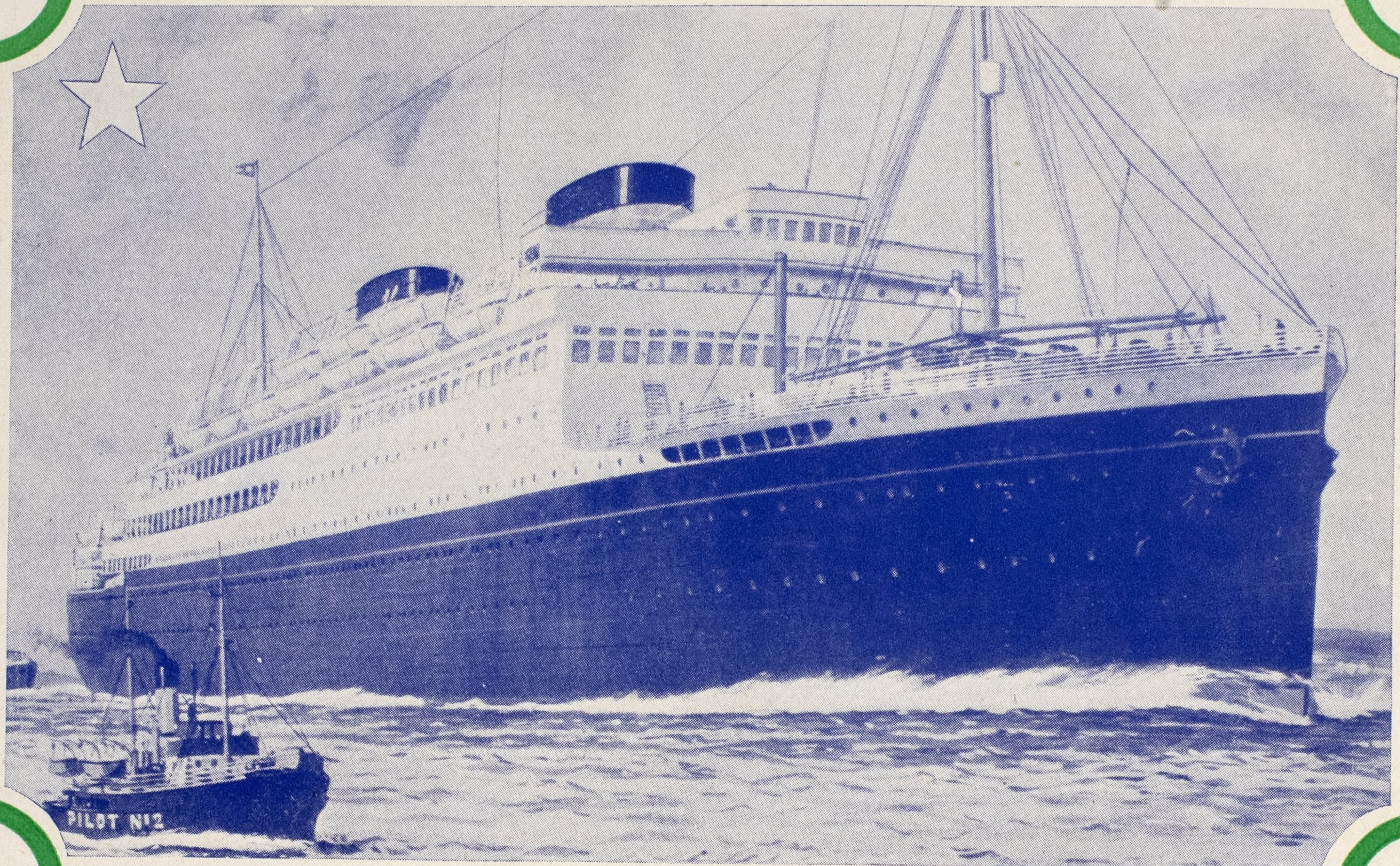
ERIE FORGE COMPANY

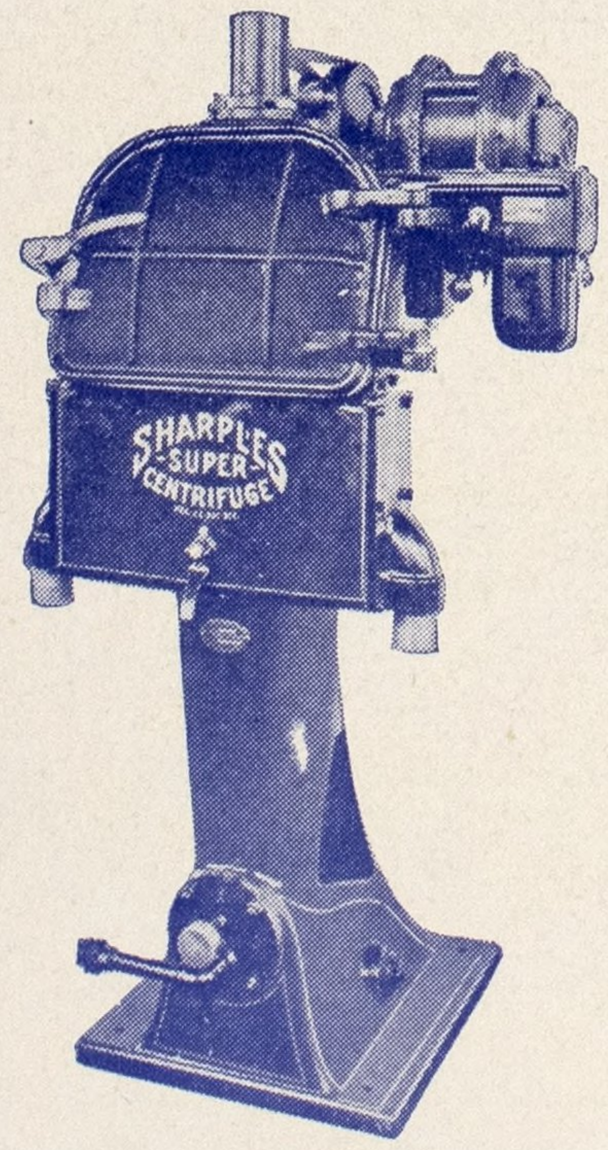
Works and Main Office Erie, Pa.

Branch Offices:

New York Philadelphia Pittsburgh St. Louis Milwaukee San Francisco
Chicago Cincinnati Buffalo Cleveland Seattle

13 SHARPLES OIL PURIFIERS on the "BRITANNIC"



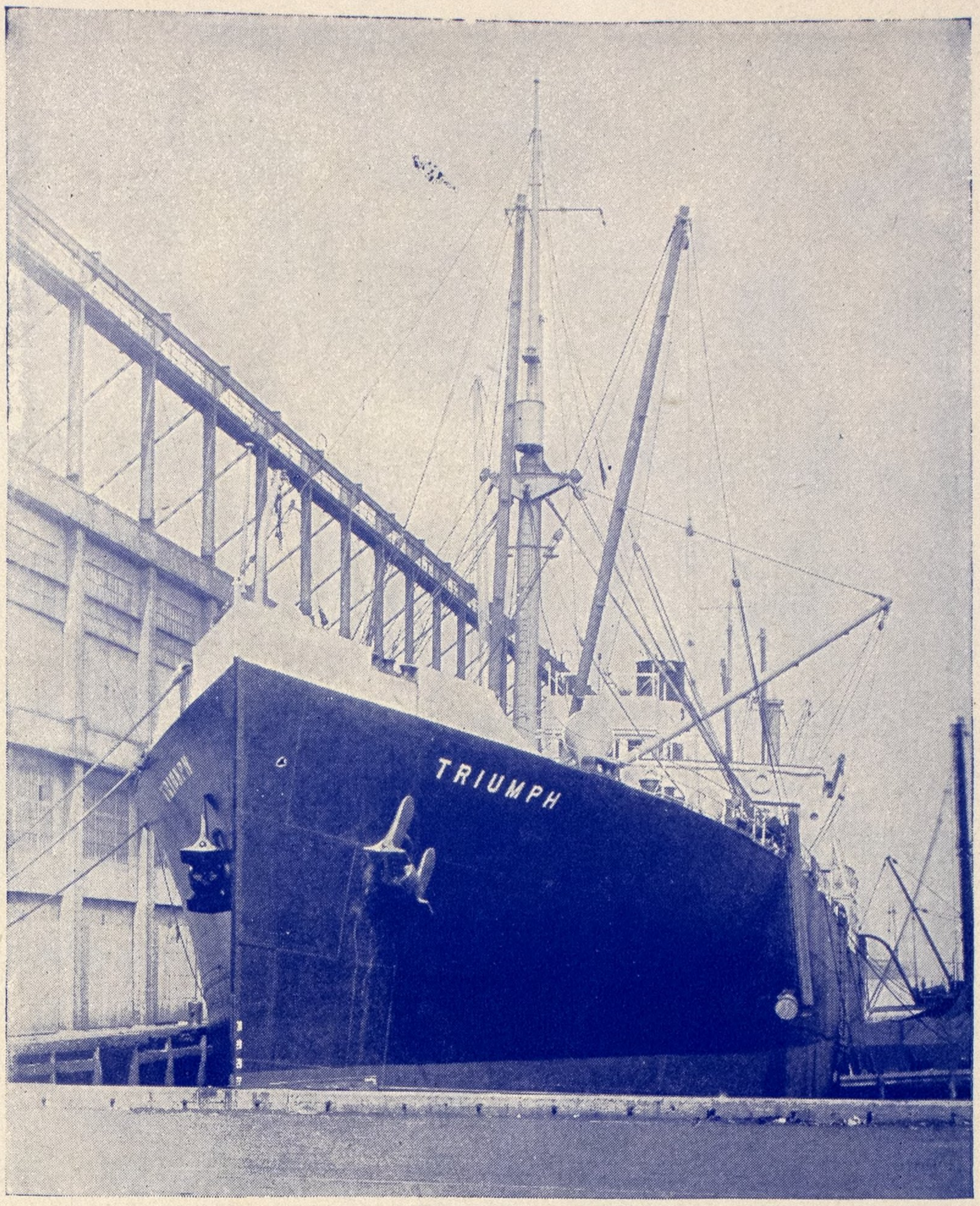


» » » WHITE STAR MOTOR LINER "BRITANNIC" IS EQUIPPED WITH 13 SHARPLES FUEL AND "LUBE" OIL PURIFIERS FOR ENGINE PROTECTION

Sharples Oil Purifiers are the easiest to handle and clean, and can be operated satisfactorily in any seaway.

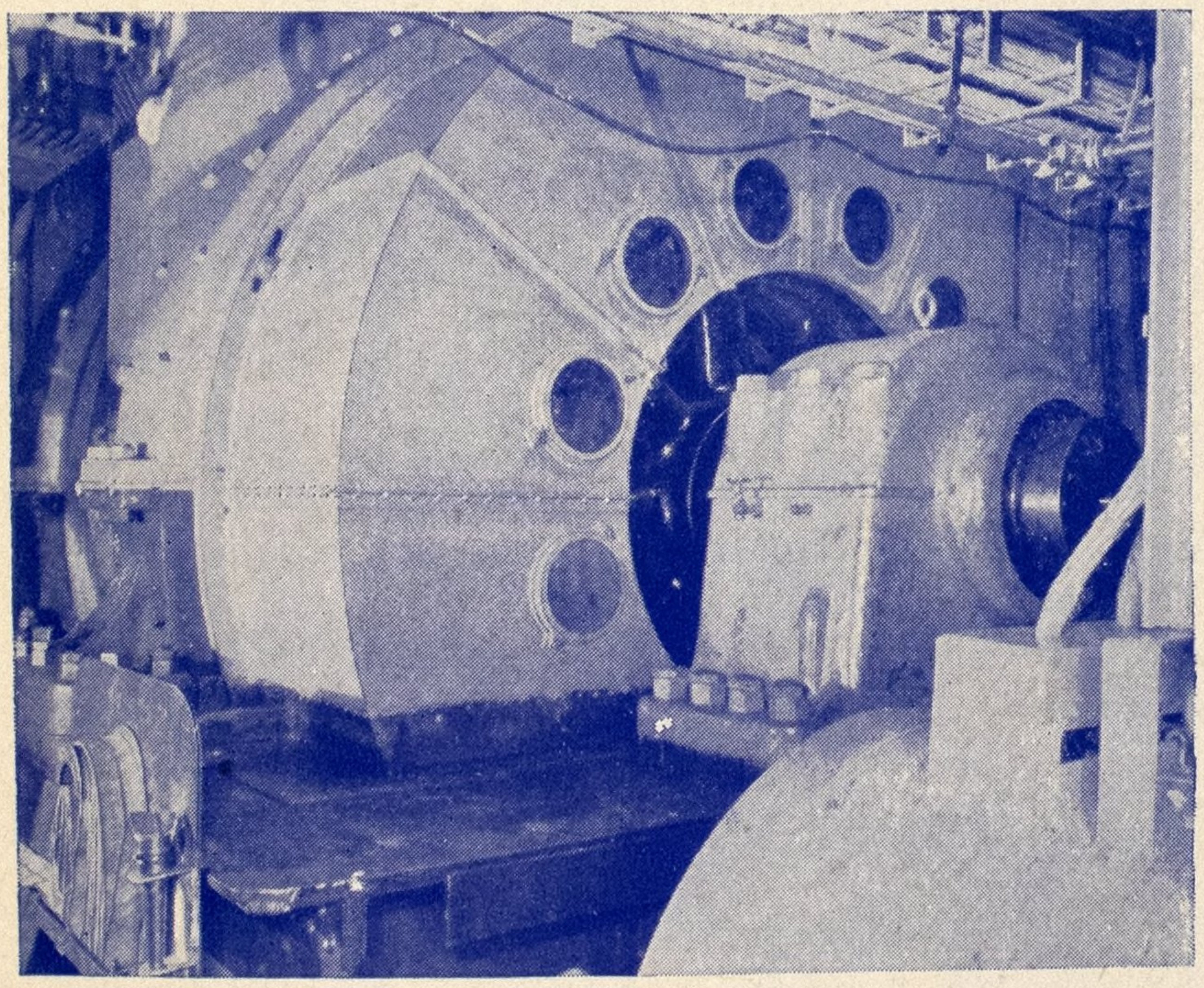
THE SHARPLES SPECIALTY COMPANY, 2338 WESTMORELAND STREET, PHILADELPHIA. Boston, New York, Pittsburgh, Chicago, Detroit, Tulsa, San Francisco, Los Angeles, Toronto. Factories in England and France.

The DIESEL ELECTRIC SHIP *is* DEPENDABLE



The Westinghouse-equipped Diesel electric ship Triumph.

The 4,000 shp. double-armature propelling motor of the Diesel electric freighter Defiance.



THE invariable dependability of Diesel electric drive for ships is due largely to the multiple generating units, any one of which can furnish sufficient power to propel the vessel.

This type of drive, thoroughly tested in actual service for the past decade, also presents the economy of the Diesel engine, and the flexibility of machinery arrangement and power distribution.

Westinghouse Diesel electric drive propels ships of many types and sizes, including tugs, yachts, ferries, tankers, cargo ships and submarines.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31538

TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.

[The Tampa Sand & Shell Co.'s tug "Lapwing" which measures 75' x 15' x 6' 6" . . . . . and is powered with a 230 H. P. Cooper-Bessemer Diesel engine.

5 years without a failure

For five years the tug "Lapwing" has been engaged in heavy towing service in southern waters, and for five years her 230 H. P. Cooper-Bessemer Diesel engine has performed with unfailing reliability, coupled with outstanding economy. During this half decade of constant and heavy-duty service the "Lapwing's" Cooper-Bessemer power plant has never failed on a single tow, and has yet to undergo its first major repair . . . Such year-in, year-out reliability is typical of Cooper-Bessemer Diesels—whether in tugs, tankers, towboats, cargo vessels or fishing vessels. Scores of commercial marine installations are continuously demonstrating the unsurpassed economy, reliability and endurance of these modern marine power plants. Whether your requirements call for 60 H. P. or 1500 H. P., whether for main power or auxiliary power, you will find a Cooper-Bessemer that will exactly meet your needs . . . A letter, wire or 'phone call will bring you complete details, specifications and performance data on any size or type desired.

COOPER-BESSEMER
DIESEL MARINE ENGINES

THE COOPER-BESSEMER CORPORATION

General Diesel Sales Offices: Suite 301, 25 West 43rd St., New York City
Plants: Grove City, Pa.—Mt. Vernon, Ohio
Canadian Diesel Representative: Diesel Power Ltd., 129 Adelaide St., West, Toronto, Ont., Canada

A London Viewpoint!

"MARINE ENGINEERING IN THE U. S. A."

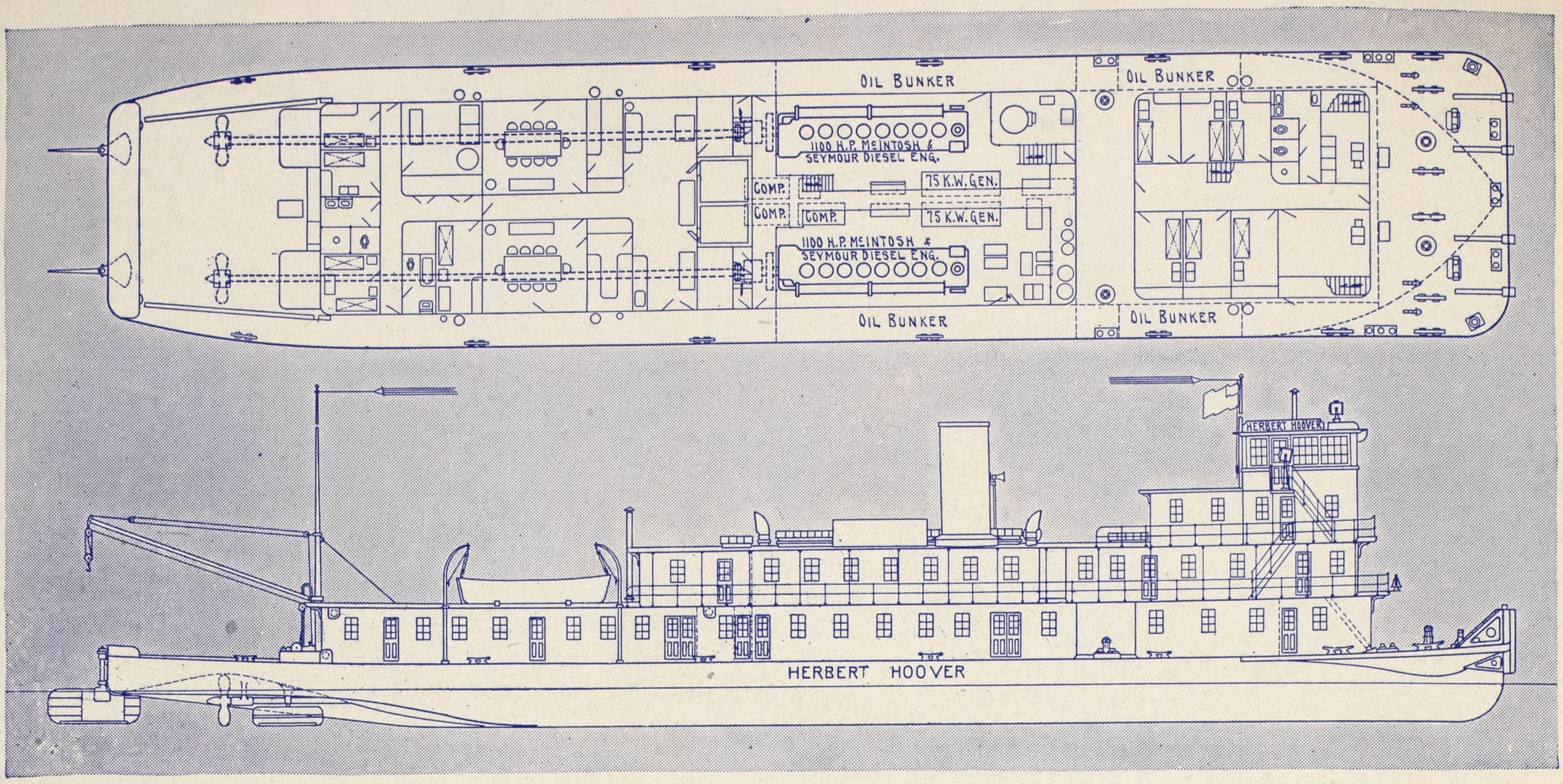
"It is impossible to avoid the feeling that one of the reasons why the turbo-electric drive has progressed in America at the expense of Diesel Machinery is that with the subsidies provided by the Government the cost of operation is not so vital a matter as it is with European owners. The immense strength, financially, of one or two of the leading American electrical concerns, who have received most of the orders for turbo-electric machinery, is, of course, another factor, and this is not to the advantage of the marine engineering industry in America, which is threatened with extinction. For practically the whole of the tonnage now building in the United States is of the passenger liner class with high-powered machinery, and for this turbo-electric plant is being mainly used.

When this is the case the orders invariably go to large electrical manufacturing corporations. This is perhaps a natural state of affairs since they can obviously build plant of this class, even including the turbines, more cheaply than is possible in any of the marine shops. The only important work given to marine engine builders of late is the Diesel machinery for a number of large tankers. There has been practically no demand for cargo-carrying vessels for some years."

from the British Motorship—October 1930

BUSCH-SULZER

BUSCH-SULZER BROS.—DIESEL ENGINE CO., ST. LOUIS, MO.



The 2200-s.hp. McIntosh & Seymour Diesel-Engine-driven Towboat "Herbert Hoover". For fast towing of 10,000 to 12,000-ton barge cargoes, upstream against Mississippi River current.

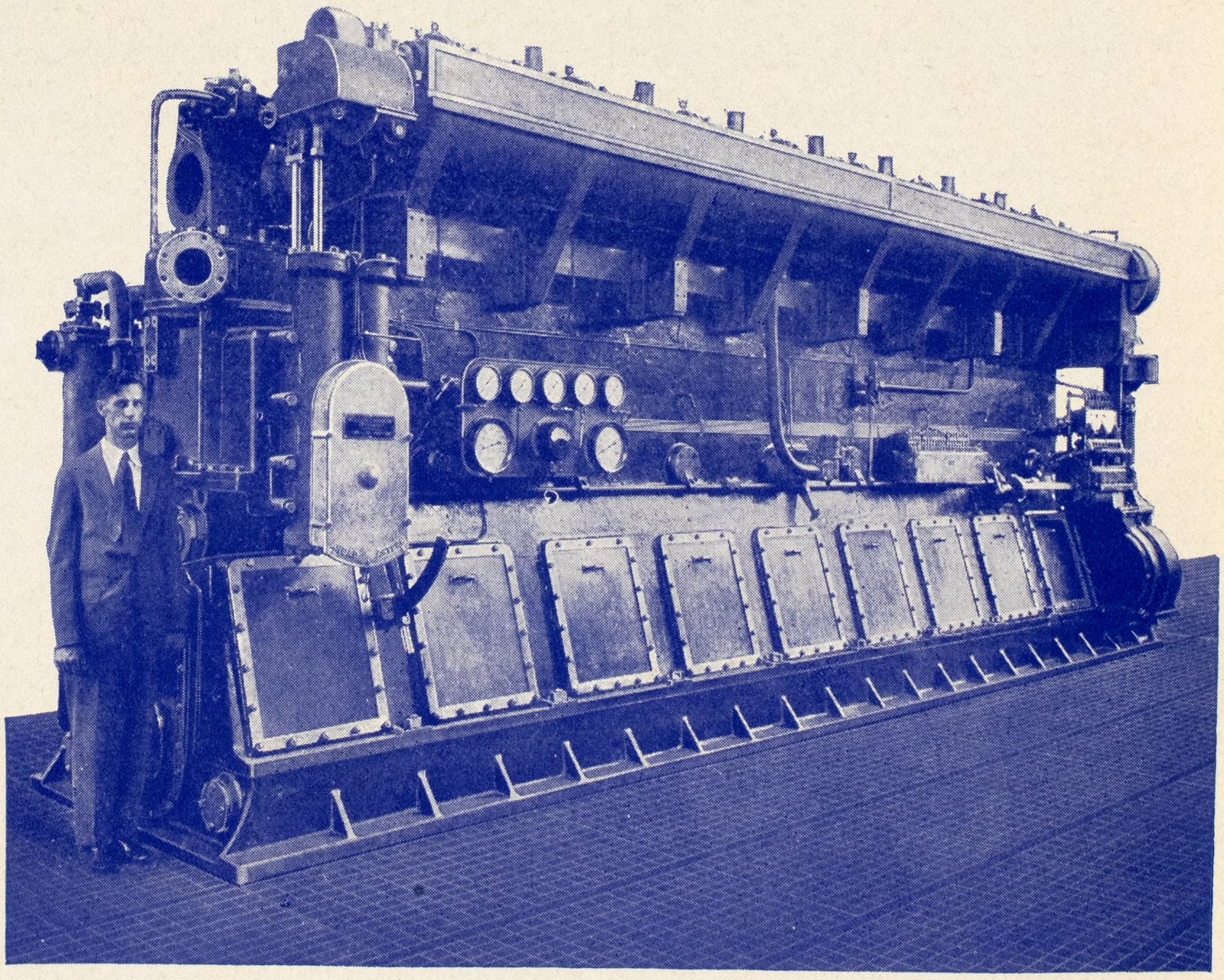
For better, cheaper inland waterway transportation

ORGANIZED to bring back neglected and once disappearing inland waterway transportation, and to co-ordinate previously uneconomical lines into systems both profitable commercially and valuable if needed for national defense, the Government-owned Inland Waterways Corporation now has 2500 miles of navigable inland channels available and will soon have 700 miles more.

In the difficult task of turning former heavy annual deficits into the substantial net profits which the corporation has shown for the past five years, dependable equipment capable of high-class service at minimized cost is essential.

Consistent with this requirement, the corporation, after experience with some 400 vessels, has chosen Diesel drive and two 1100-hp. McIntosh & Seymour Engines for the Mississippi River Towboat "Herbert Hoover", which is to be the largest and finest Diesel-driven vessel of its kind in existence.

Employing Diesel power and McIntosh & Seymour Engines on large river and lake towboats is an engineering advance which private capital could follow to advantage.



One of the two 1100-b.hp. 8-cylinder directly reversible McIntosh & Seymour Engines for Towboat "Herbert Hoover". Speed 200 r.p.m.

McIntosh & Seymour Engines are made in suitable types and sizes for most all inland and sea-going needs. Let our Engineers submit cost and performance data. Write for booklet "McIntosh & Seymour Diesel Engines for Motorships".

McINTOSH & SEYMOUR CORPORATION, Auburn, N. Y.

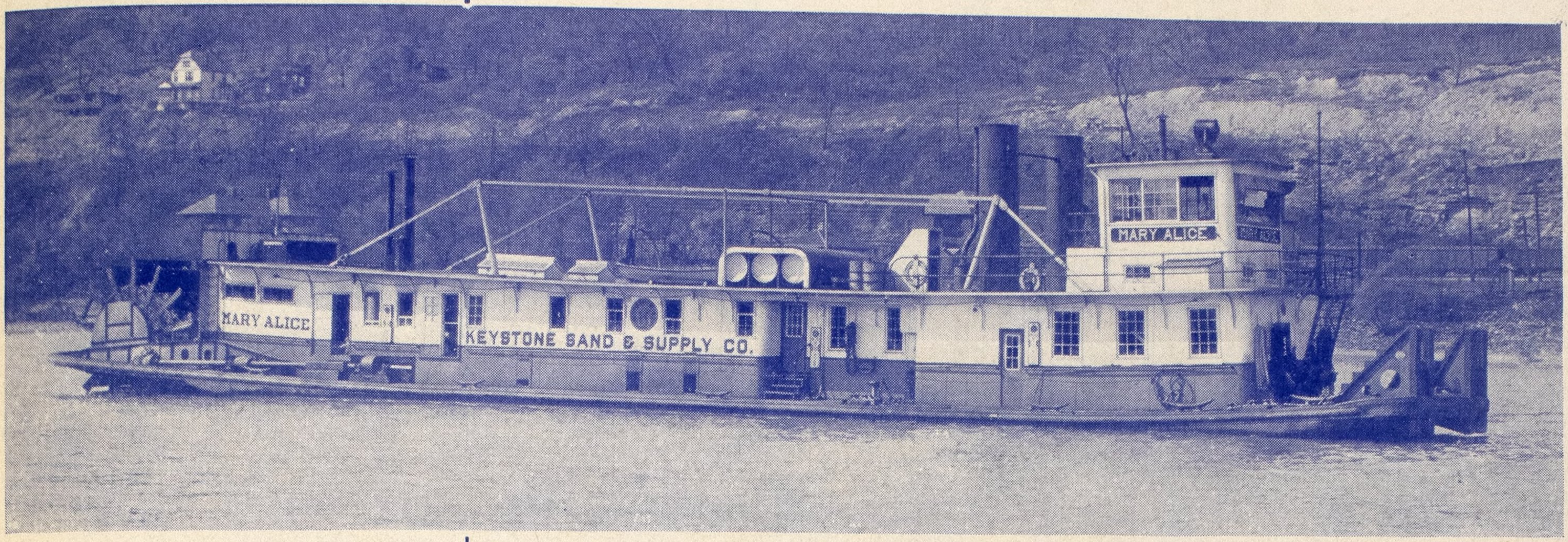
Division of American Locomotive Company

New York City	Kansas City, Mo.	Jacksonville, Fla.	Houston, Tex.	San Francisco
30 Church Street	1016 Baltimore Ave.	412 Bisbee Bldg.	2703 Esperson Bldg.	514 Matson Bldg.

McINTOSH & SEYMOUR DIESEL ENGINES

1100 Steel Hulls

built in the last 15 years



M. S. Mary Alice

Length O. A. 158' 7⅞"
Breadth 26' 6"
Draft 4' 2"
Displacement loaded 365 tons
Gross tonnage 214
Net tonnage 203
Split stern wheel drive with separate diesel engine for each half.

DRAVO has for fifteen years specialized in the construction of every type of floating craft for inland river, harbor and coastwise service, including barges, dredges, derrick boats, whirler boats, lighters, mixer boats, compressor boats, oil barges, dump scows, car floats, and all types of—

Steam and Diesel TOWBOATS

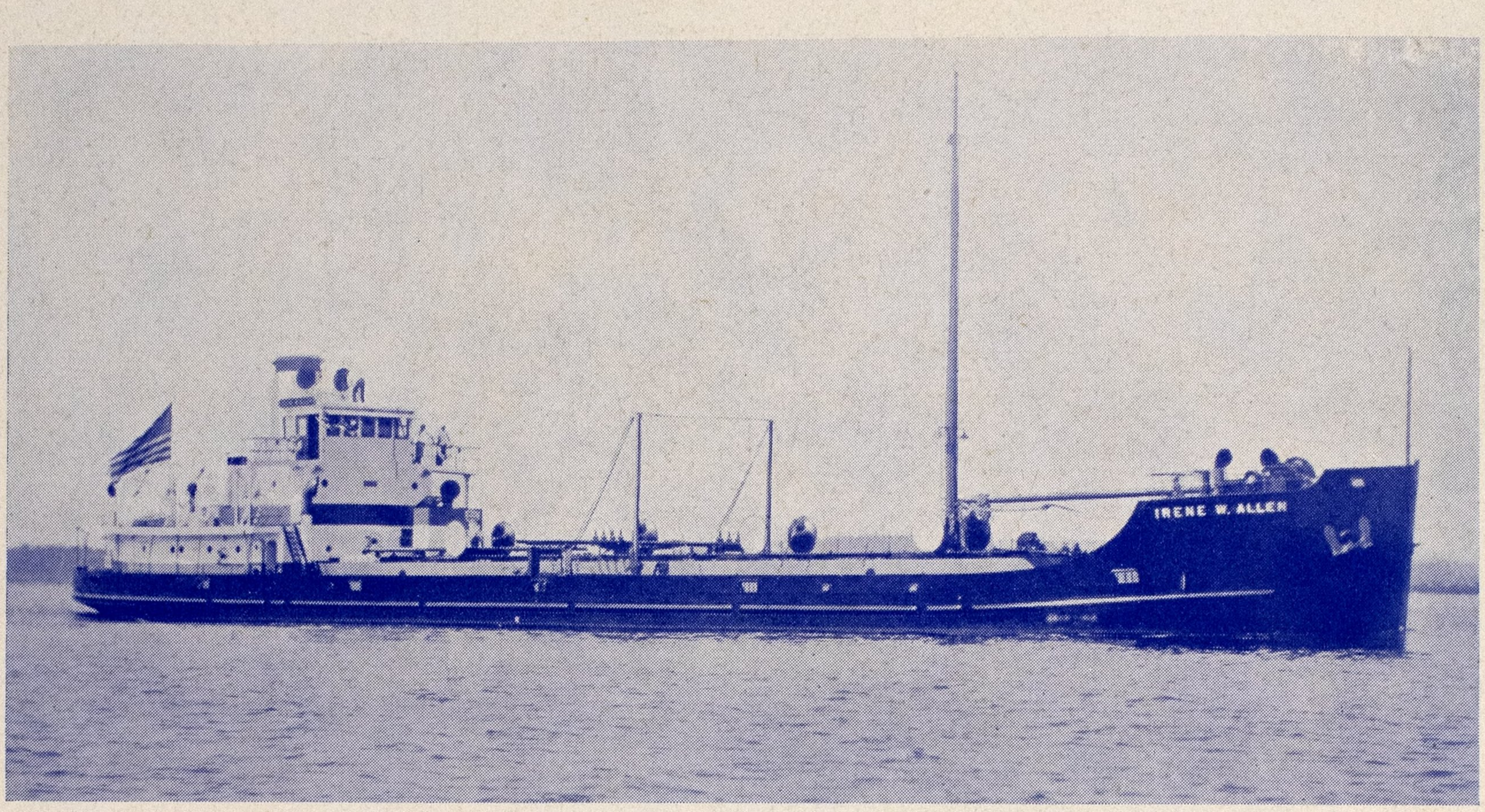
Also specialists in dock and material handling installations.

The Dravo Contracting Company

Ship Yards:

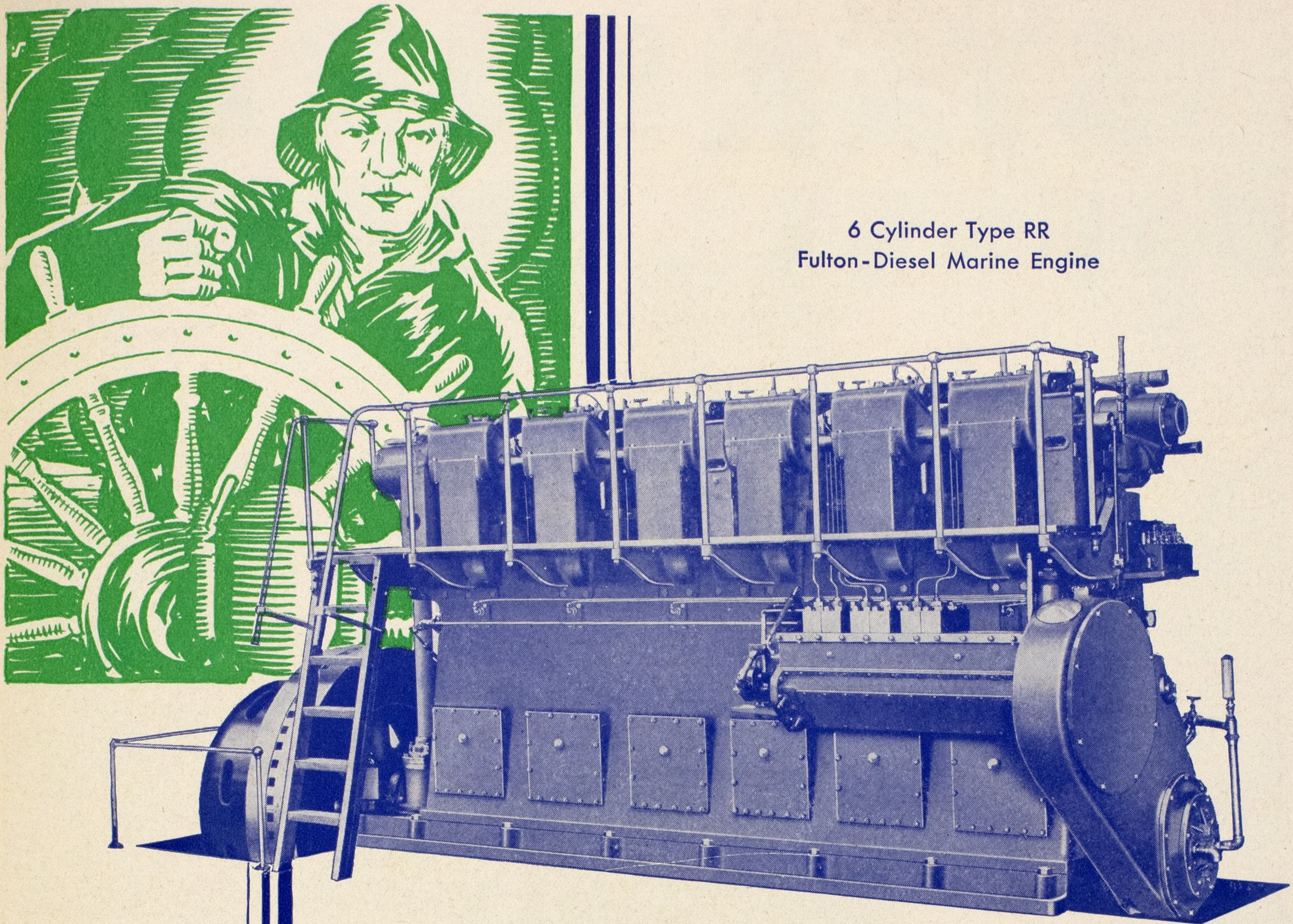
Wilmington, Del. Pittsburgh, Penna.

MODERN ENGINES for EFFICIENT WORK BOATS



THE Irene W. Allen, illustrated above, is one of five modern Winton-powered tankers recently completed by Bethlehem Shipbuilding Corporation for Lake Tankers Corporation. These five vessels, now in service along the Atlantic Coast, give the owners five of the finest tankers afloat. Winton main engines and complete Winton auxiliary equipment, all designed to function together smoothly, insure practically no loss of time in operation, and reduces to a minimum costly idle time incurred for layup and repairs. Details regarding special requirements for workboats of all kind supplied upon request.

WINTON ENGINE CORPORATION, CLEVELAND, OHIO
U. S. A.



6 Cylinder Type RR
Fulton-Diesel Marine Engine

Under the expert control of the Helmsman his ship clings to her course in the highest sea . . . . and if powered by a Fulton-Diesel, has the added strength and extra horse power to bring a heavy cargo swiftly to port.

The actual capacity of Fulton-Diesel Marine Engines is 10 to 15% above their rating. This gives extra horse power when it is needed. The straight line frame directs all stresses to the rigid bed plate and thus insures perfect alignment. These features, plus a totally enclosed frame (with each part easily accessible), direct reversible mechanism, and economical operation make Fulton-Diesel Marine Engines supreme in their field.

If you are planning new construction or conversion, let us analyse your requirements and make specific recommendations. No obligation, of course . . . . Fulton Iron Works Company, St. Louis, Mo., U. S. A. New York Office, 82 Wall St.

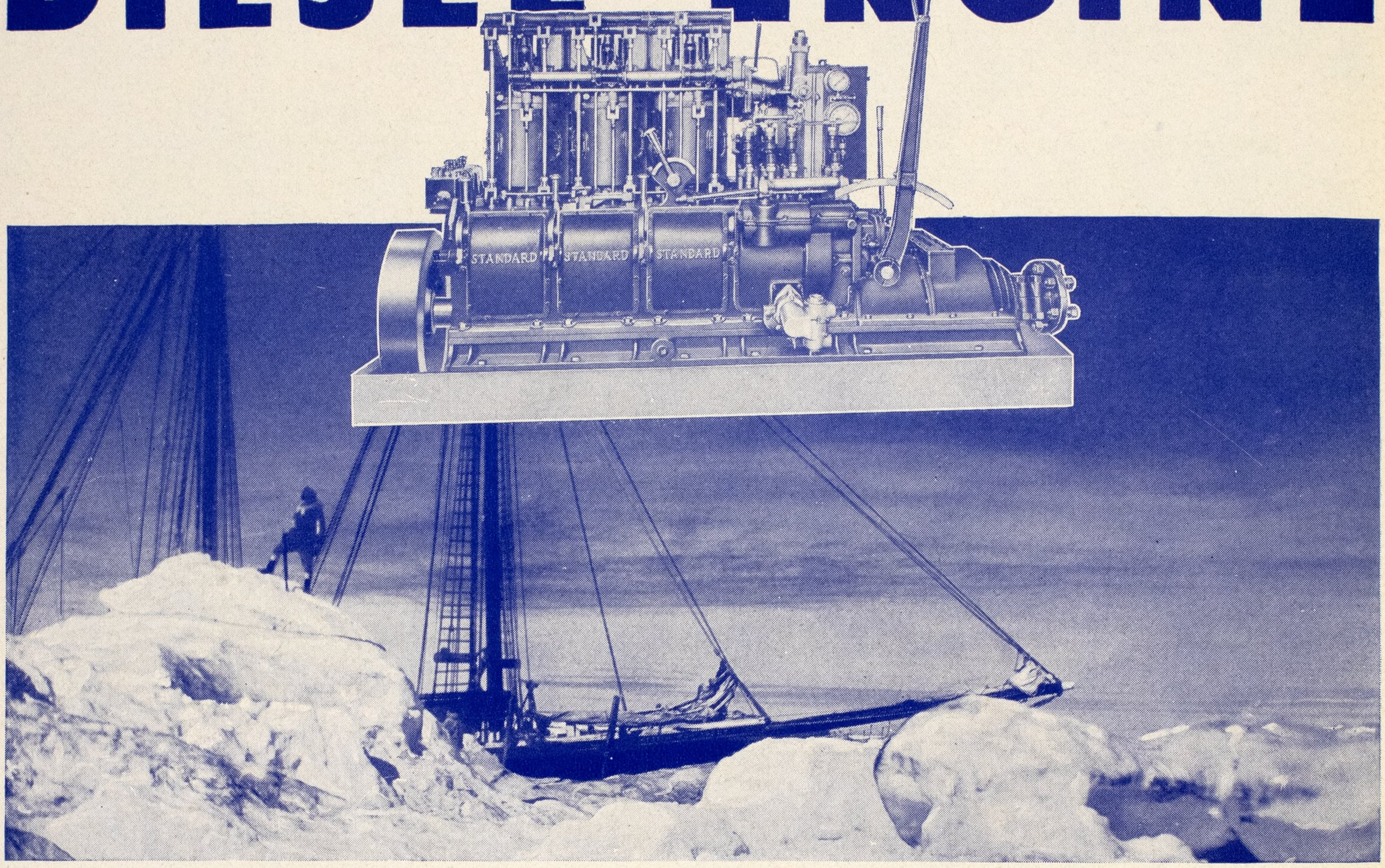
SUCCESSFUL ENGINE BUILDERS FOR OVER SEVENTY-FIVE YEARS

FULTON DIESELS

695

FOR MARINE SERVICE . . . . . 100 TO 200 HORSE POWER

STANDARD DIESEL ENGINE



200,000 Miles Without a Falter in the Ice Floes of the Far North

CAPTAIN BOB BARTLETT, SKIPPER OF THE MORRISSEY, and veteran of many Polar Expeditions, knew well the hazard of the Far North without a dependable engine. A stop even for ten minutes meant destruction of ship and crew.

His expedition to Siberia would have been folly without the definite assurance of dependable motive power day in and day out. Every engine made in America and foreign countries was at his command—but he bought a Standard Diesel because he had to have a sturdy, powerful engine, so dependable that he could wager his very life that it would not fail him.

The 3 cylinder Standard Diesel engine, installed as an auxiliary, pushed the schooner Morrissey for more than 200,000 miles on four trips without requiring repairs.

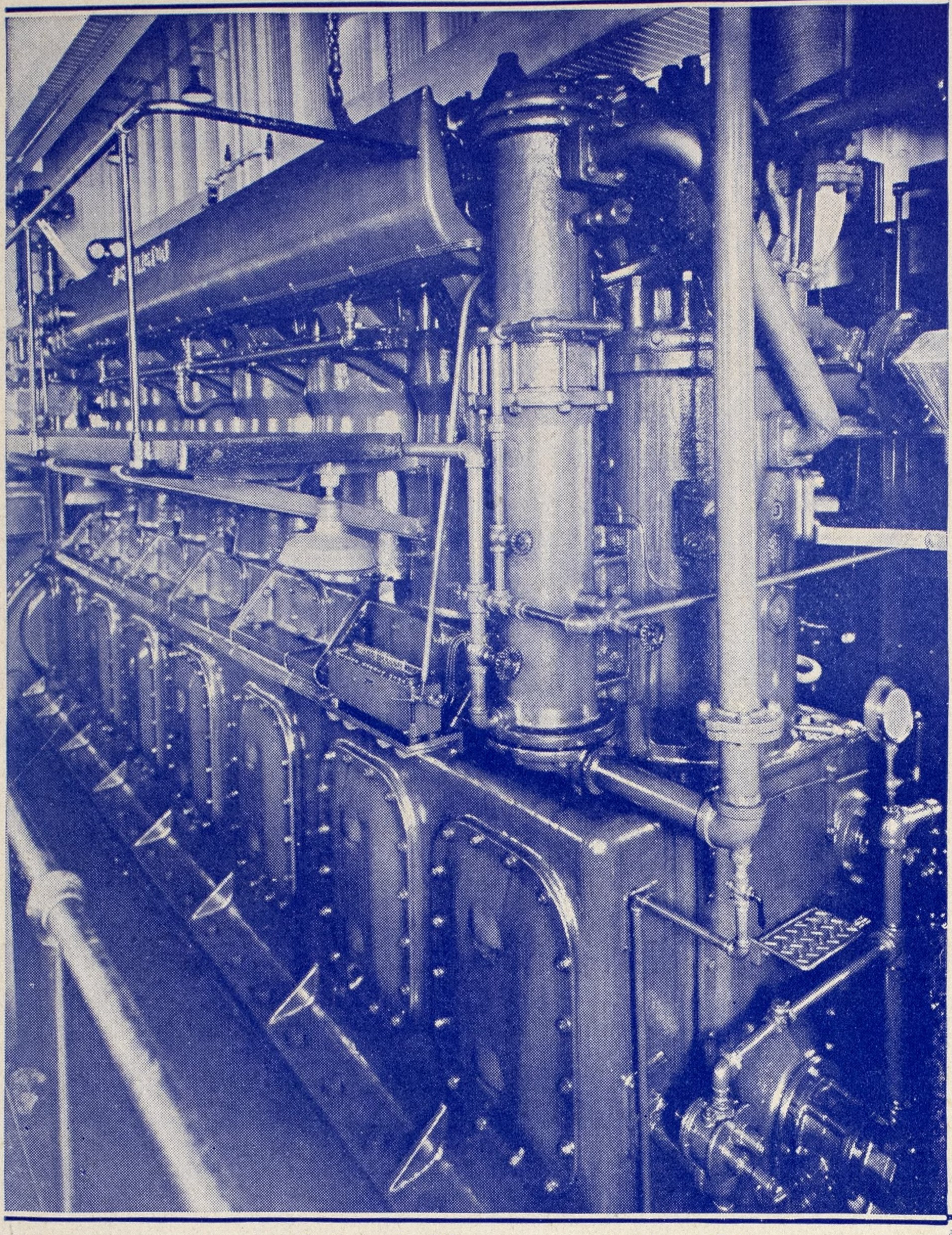
Performance, not theory, proves that here is a Diesel with more than ordinary endurance; one that has full power with ample overload capacity and smooth, consistent operation.

The Standard Diesel line includes 3, 4, 6 and 8 cylinder full Diesel engines ranging from 50 to 500 horsepower. The 3 and 4 cylinder Standard is directly reversible, an exclusive patented Standard feature. Write for descriptive literature and quotations on your specific requirements.

The map shows the route of the Morrissey on her four yearly trips (1926, 1927, 1928, 1929) during which she braved the frozen dangers of Siberia and was the only vessel seen in the Fox Channel section in more than 150 years.

STANDARD MOTOR CONSTRUCTION CO.
172 WHITON STREET, JERSEY CITY, NEW JERSEY

I-R Diesels like their owners
Whether installed on big tankers or little tugs, I-R solid-injection Diesels serve their owners well.
On tankers or freighters they will be found working steadily for days on end to bring the boats to port in record time.
On busy tugs which may at one moment require full speed ahead and in the next moment all power astern, I-R engines respond promptly to control.
The steady dependable service of I-R engines means faster trips, easier and surer handling, and lower costs.
INGERSOLL-RAND CO.
11 Broadway New York
IR
Ingersoll-Rand
R-2137



The power plant of the Gulfport . . . a Worthington 17" x 25", Six-cylinder 4-cycle Air-injection Diesel Engine

Dredge Gulfport *powered by* Worthington Diesel Engine

PUMPS
All Sizes...All Types
For All Services
Any Capacity...Any Pressure
COMPRESSORS
Stationary and Portable
CONDENSERS
and Auxiliaries
DIESEL ENGINES
GAS ENGINES
FEEDWATER HEATERS
WATER, OIL and GASOLINE METERS
MULTI-V-DRIVES
ROCK DRILLS
AUTOMATIC HEAT TREATING MACHINES FOR DRILL STEEL
FORGING FURNACES FOR DRILL STEEL
DRILL STEEL
ACCESSORIES
CHROMIUM PLATING

Literature on request

THE *McWilliams Dredging Company,* in designing the *Gulfport,* demanded a Diesel power plant capable of operating for long periods, under heavy overloads, without stops . . . in other words, a time-proven engine that could turn reliable performance into profitable dredging.

The selection of a Worthington Diesel Engine for this modern dredge again focuses attention on the long list of creditable records that Worthington units have established . . . both in stationary and marine service.

Write to the nearest Worthington office for information on Diesel engines to fit *your* requirements.

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION
Works: Harrison, N. J. Cincinnati, Ohio Buffalo, N.Y. Holyoke, Mass.
Executive Offices: 2 Park Avenue, New York, N.Y
GENERAL OFFICES: HARRISON, N. J
District Sales Offices and Representatives:

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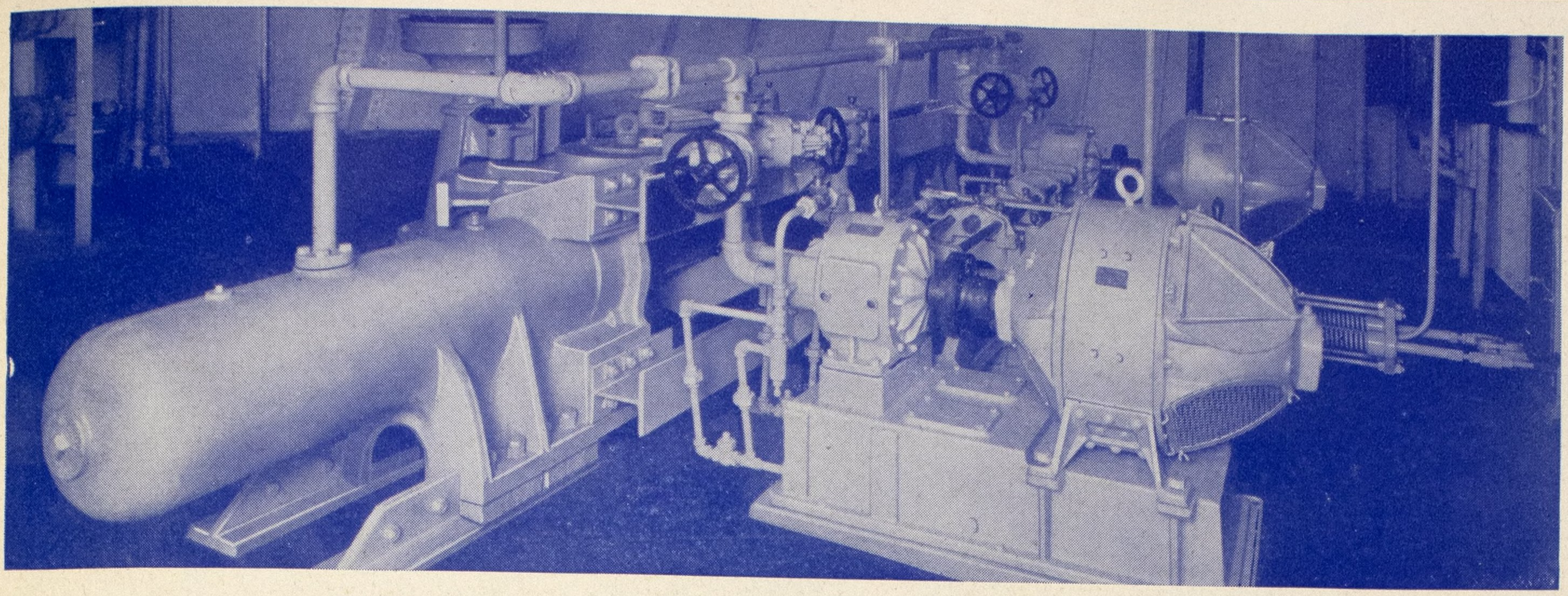
ED-30

Branch Offices or Representatives in Principal Cities of all Foreign Countries



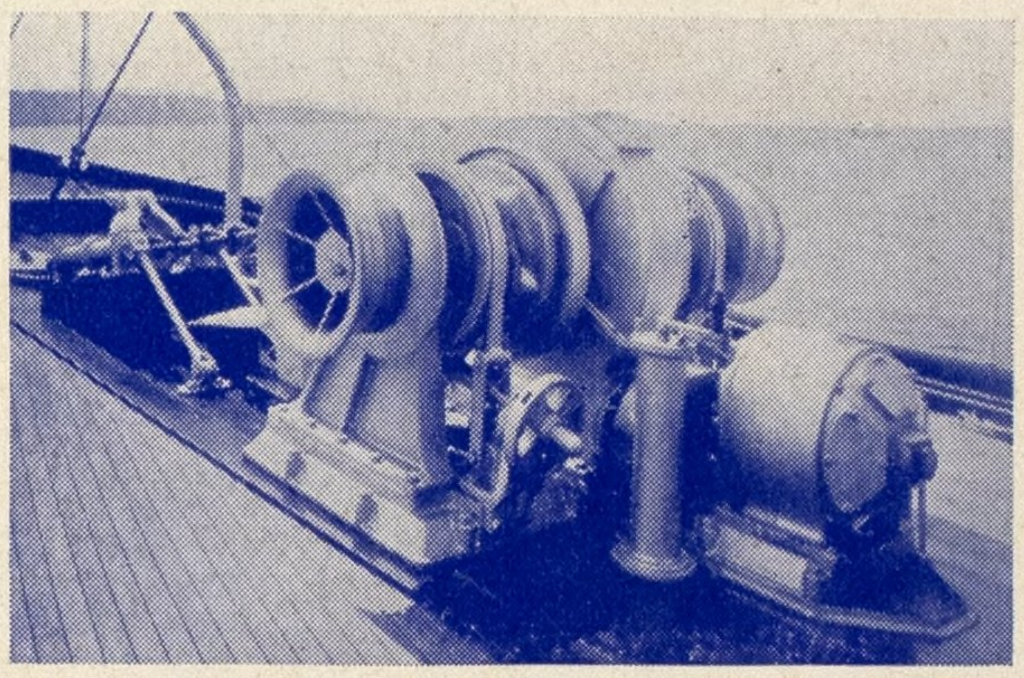
A-E-CO Electro-Hydraulic Steerer on Motorship City of New York

—*On Diesel boats of every type*—

A-E-CO MARINE AUXILIARIES

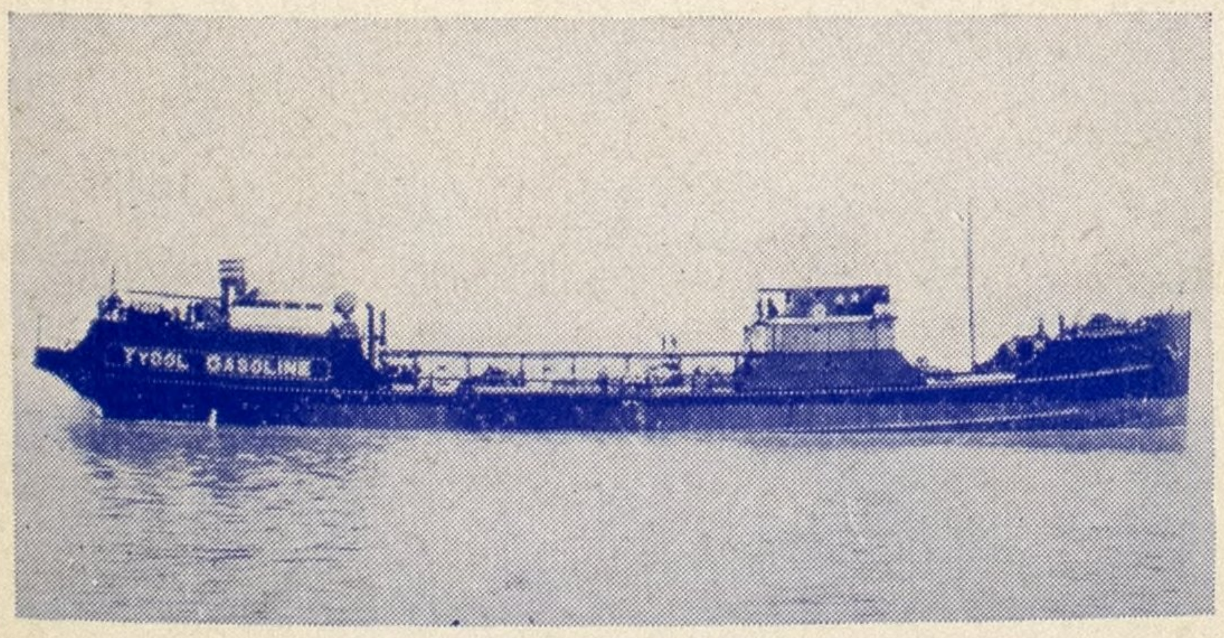
For work or play . . . on tanker, tug, liner, yacht . . . wherever Diesel power is used afloat . . . one finds boats handled by A-E-CO electro-hydraulic steerers; anchors raised by A-E-CO electric windlasses and the lifting and hauling jobs done by husky A-E-CO electric capstans, hoists and winches.

Since 1857, the list of A-E-CO installations is a roll of honor of America's notable ships. Today, on Diesel and Diesel-electric boats, A-E-CO marine auxiliaries hold the same proud position of leadership that they assumed when steam first came into use and made power-driven auxiliaries possible. The pictures on this page show just a few of the many new boats equipped with A-E-CO Auxiliaries.



A-E-CO Electric Windlass of type used on large Diesel Yachts

The Tidewater
Pusey & Jones, Builders



The Veedol No. 2
Pusey & Jones, Builders

AMERICAN ENGINEERING COMPANY · PHILADELPHIA · AE CO

A-E-CO. PRODUCTS

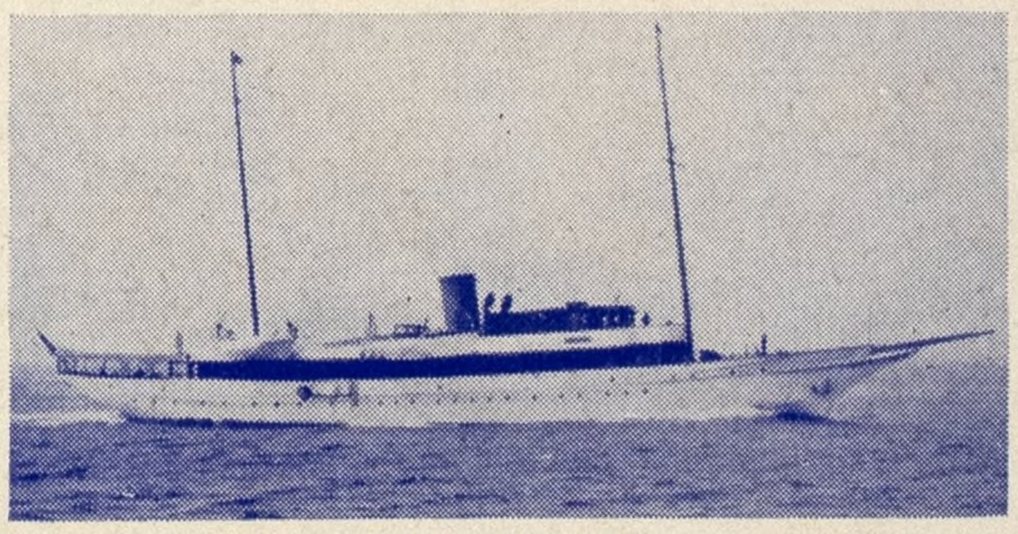
Taylor Stokers

A-E-CO Water Walls

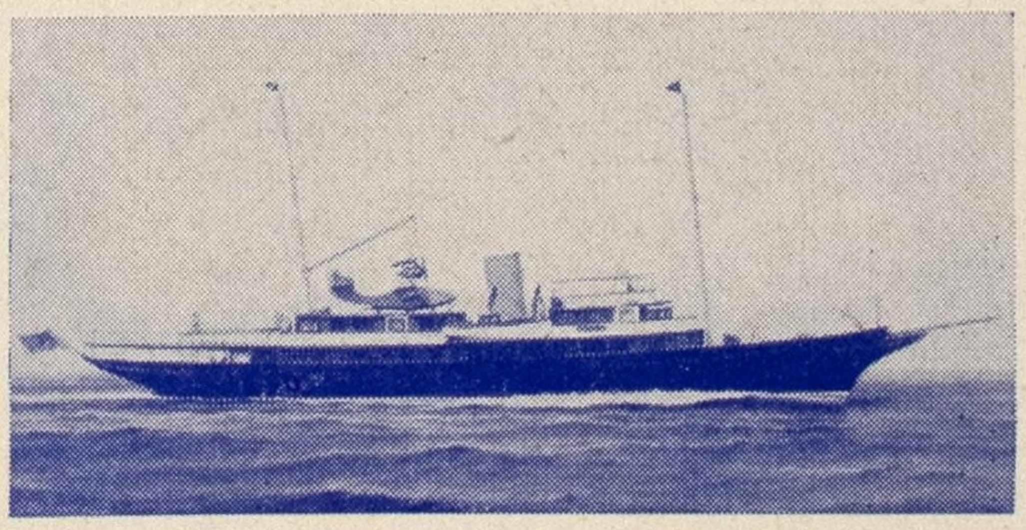
Lo-Hed Electric Hoists

Juruick Refrigeration

A-E-CO Marine Auxiliaries



The Placida
Designed by Henry J. Gielow



The Lotosland
Designed by Cox & Stevens

AMERICAN ENGINEERING

AMERICAN ENGINEERING COMPANY, 2437 ARAMINGO AVENUE, PHILADELPHIA

UP and DOWN the RIVER

THE MARY ALICE, *Diesel-powered; owned by Keystone Sand & Supply Company, built by The Dravo Contracting Company, Pittsburgh; equipped with dependable 60-cell Exide-Ironclad Battery.*

This dependable Diesel towboat, Mary Alice, *relies on Exide-Ironclad Batteries*

THE *Mary Alice* has a tough job. Day in and day out she plies up and down the river towing heavily loaded barges. She must have sturdy, reliable equipment to stand up in this service.

That's why an Exide-Ironclad Battery was installed. 60 cells of MVA-19 Exide-Ironclad operate in series parallel on cycle duty. When the generator is not in operation, this powerful battery carries the load of the refrigerating plant, lights and searchlights and portable pumps for siphoning the barges.

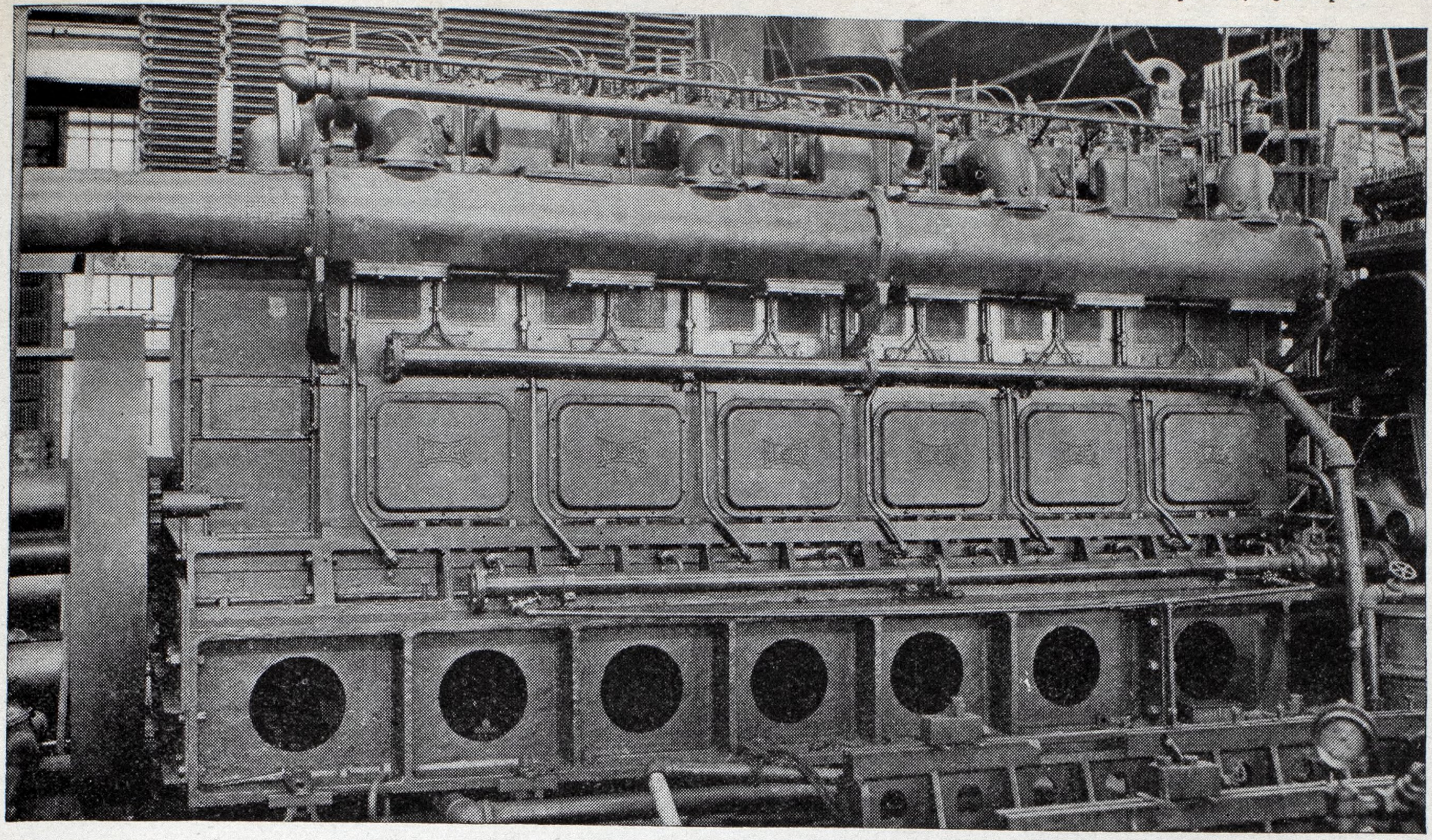
No matter what the job—on ocean liners, ferries, tugs . . . any kind of vessel—there's an Exide Battery built to do it and do it steadily, dependably and economically. Many boats have installed the Exide Marine Floating Battery System for greater convenience, safety and economy in operation of the electric power plant.

Write for information on Exide and Exide-Ironclad Batteries and their many varied applications in marine service. No obligation. Do it today.

Exide
IRONCLAD MARINE BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE
Exide Batteries of Canada, Limited, Toronto

Type 6 MI-53, 6-cylinder, 4-cycle, mechanical injection Nelseco Marine Diesel Engine, developing 1000-1200 b.h.p. at 250-300 r.p.m.



Nelseco announces a new 1200 h.p. Diesel

AFTER satisfactory completion of continuous and very severe shop tests which have extended over a period of nine months, Nelseco is prepared to make deliveries of a newly designed 1200 h.p. Diesel which has been developed for use in Diesel-electric installations.

The moderate weight and compact design of this new Nelseco model enable it to be used in connection with electric drive at the sacrifice of no more space than is required by large slow-speed direct-connected engines. Furthermore, the first cost of such a Diesel-electric installation is practically no greater, even though the electrical apparatus is included.

Advantages of Diesel-electric over direct drive are well known, a few of which are: Greater reliability at sea; less time lost in port, as repairs may be made at sea without appreciably affecting ship's speed; most efficient propeller speed may be selected; instant pilot-house control; use of one main engine for carrying auxiliary loads in port; saving of cargo space due to elimination of shaft alley.

Type 6 MI-53, 6-cylinder, 4-cycle, mechanical injection Nelseco Marine Diesel Engine, developing 1000-1200 b.h.p. at 250-300 r.p.m., incorporates the soundest and most modern principles of design which have been developed by an organization outstanding in its field for many years. It will be found flexible and reliable in performance, and economical both in first cost and in operation. We shall be glad to send you complete information about this or any other model. (The range of Nelseco Diesel Engines includes types for tow-boats, yachts, passenger, freight and fishing vessels of all descriptions.) Write for Catalog MR.

ELECTRIC BOAT COMPANY

NEW LONDON SHIP AND ENGINE WORKS, GROTON, CONN., U. S. A.

New York Sales Office: 247 Park Avenue, New York City

NELSECO

Original licensees from and collaborators with M. A. N. since 1910

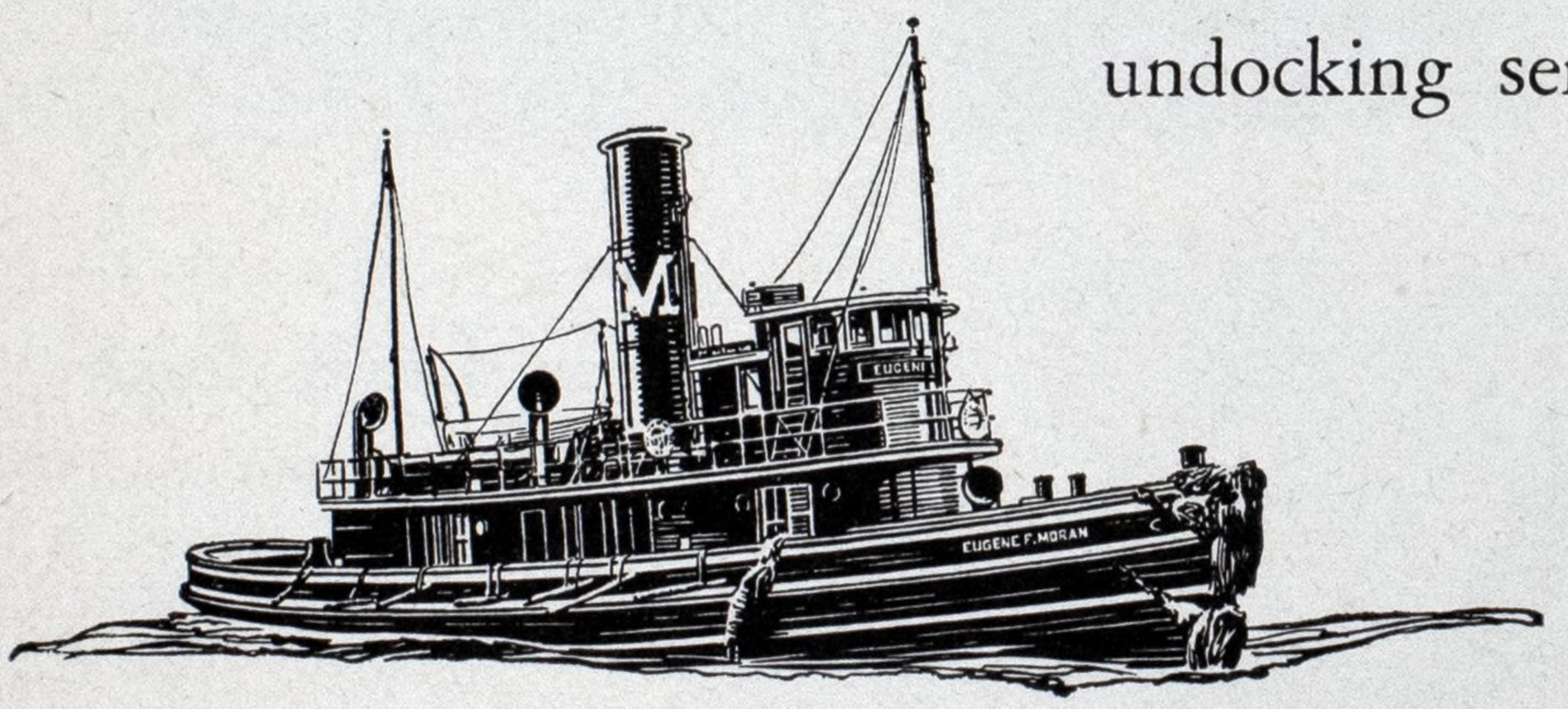
Chicago Representative	Boston Representative	West Coast Representative	Memphis Representative
H. JACOBSEN	ELECTRIC BOAT CO. OF MASS.	KING-KNIGHT CO.	J. S. BRONSON
25 North Dearborn St., Chicago, Ill.	126 State Street, Boston, Mass.	Seattle, San Francisco, Los Angeles	1348 Madison Ave., Memphis, Tenn.

MORAN SERVICE

Alert every hour of the twenty-four

THE whole twenty-four hours are business hours in the Moran organization. Moran Service is never further away than your telephone. ¶ Rapid as has been the growth of New York Harbor, Moran equipment, and personnel, both afloat and ashore, have anticipated the needs of owners and operators and industrial groups through three generations of the same ownership. That means a generous margin of abilities and facilities to handle every possible marine activity, emergency or otherwise. And, day or night, the standards of Moran Service do not vary in their high quality—the same service that has made the name of Moran an honored one in harbor history for nearly seventy years.

Those are some of the reasons why foreign and domestic owners and operators value the docking and undocking services of Moran. Experience, skill and financial integrity in marine traffic and transportation problems, and a thorough knowledge of the harbor's tidal and channel conditions constitutes, together with unexcelled floating equipment, a guarantee of protection for their enormously valuable property.



The harbor tug, "Eugene F. Moran", another of the fleet, is 100 feet long and rates about 700 H.P. One of the special ship-handling tugs maintained by Moran Service.

MORAN TOWING AND TRANSPORTATION COMPANY, INC.

17 Battery Place, New York *Phone Whitehall 1340*

MORAN Service

"Clarktor" Tructractor: Self starter, electric lights, 3600 lbs. d.b.p., solid or pneumatic tires, turning radius 108".

"Clarktor"
—a new dock-walloper

A powerful industrial tractor capable of handling an immense volume of cargo quickly and at low cost. Snakes long lines of heavily laden trailers at cost-reducing speed along narrow aisles, through tight doorways, on crowded wharves, up steep ramps. Nimble in traffic. Indispensable in moving heavy cases and bales—pugnacious in pushing—quickly couples to a load and pulls it swiftly. Congestion melts away with the "Clarktor" on the job.

Standard truck transmission, multiple disc clutch, Clark truck axle, self-starter, generator, battery, head and tail lights. Any man who can drive a car can operate it, any good mechanic can service it. Feed it a little gas and oil and it's good for continuous service—it never tires. ***Also built with boom crane.***

Special Note!

Clark vehicles are gas-powered—therefore competent for 24 hour continuous service and just as potent the last hour as the first.

Clark 24-hr. continuous service

Ordinary 8-hr. service

Write for details of this tractor and its economical performance. *Mention this advertisement*, to be sure to get information on this particular model.

The Clark Tructractor Co.
Battle Creek, Mich.

How to make greater profits on short cargo movements...

One man with an Elwell-Parker Electric Lift Truck loads or unloads 100 tons of freight in one and one-half hours at this terminal. Previously it has required six men four or five hours to do the same job. More trucks have been added this year.

IN *all* cargo movements, the cost of handling at the terminals makes up a big part of total operating expense. In most cases, about 30%.

Since practically the same amount of *handling* must be done for both long and short hauls, it is at once apparent that terminal handling costs are proportionally larger on short cargo movements than on longer movements.

When handling operations are speeded up and costs reduced at the terminals, profit margins on all movements will be increased. Naturally the short hauls will show the greatest ratio of savings.

Wide-awake steamship men at all ports are realizing the tremendous opportunities for increased profits presented by Elwell-Parker Electric Trucks. A trial at one terminal inevitably leads to installations at others.

Do you know what savings can be made at your terminals? It will pay you to get the facts—as it has paid scores of others. Terminal handling costs are too important to be neglected.

Ask your nearest Elwell-Parker Engineer to make a recommendation for your terminal. It will cost you nothing and places you under no obligation. If you prefer, write direct to the Home Office in Cleveland.

★Low center of gravity is a notable Elwell-Parker feature. It assures greater stability on curve, level or incline, and permits placing the operator nearer the load, giving him a clear and unobstructed view ahead. This makes for greater safety.

THE ELWELL-PARKER ELECTRIC COMPANY, 4200 ST. CLAIR AVENUE, CLEVELAND, OHIO

SHIP on SKIDS

Elwell·Parker

Designers and Builders of Electric Industrial Trucks, Tractors and Cranes for a Quarter Century.

These Remarkable Tubes

Slash Handling Costs

THE Exide-Ironclad Battery is absolutely different from any other battery. In the construction of this battery positive plates are used in which the active material is held in finely slotted rubber tubes.

These tubes permit the solution to pass freely through the slots, but the active material itself cannot readily escape. The action is similar to that of a tea ball dipped in a pot of boiling water. This construction accounts for the unusually long life of the battery.

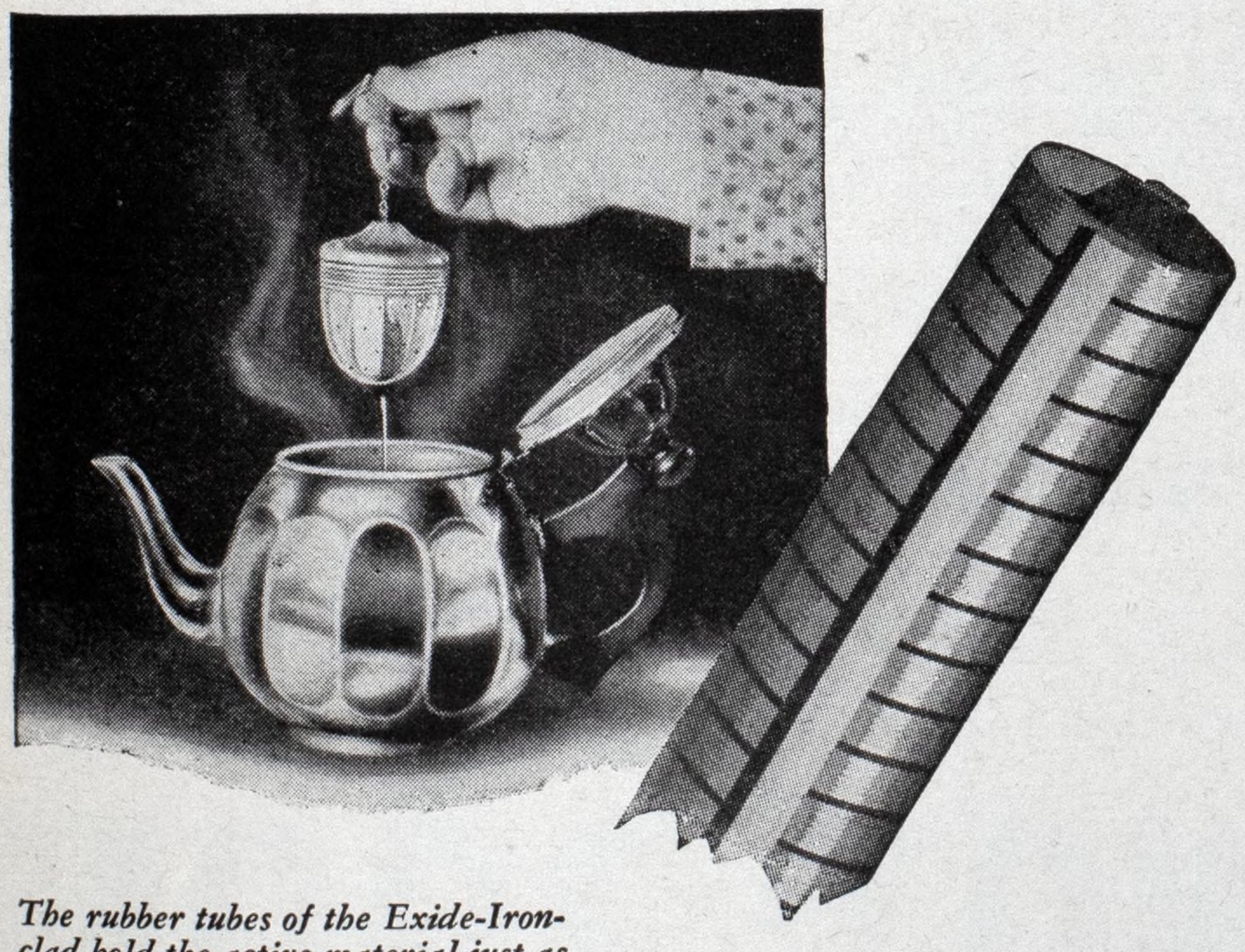
Exide's skilled engineers have designed Exide-Ironclad Batteries for trouble-free performance . . . to produce tremendous power when called upon to climb a steep grade or pull an extra-heavy load. That's why thousands of Exide-Ironclads are in use in industrial trucks and tractors today. When you want the utmost in battery value and efficiency, you gain these distinct advantages from Exide-Ironclads:—

This is the famous positive plate of Exide-Ironclad Battery with its slotted rubber tube construction.

1. The Exide-Ironclad is built to deliver and maintain a consistently high voltage throughout the day's work.
2. The Exide-Ironclad takes current quickly and easily — with little waste —at the charging panel.
3. The Exide-Ironclad is designed to give a steady, reliable flow of current throughout an unusually long life.
4. The Exide-Ironclad is made by the world's largest manufacturers of storage batteries for every purpose and backed by 42 years' experience in battery construction.

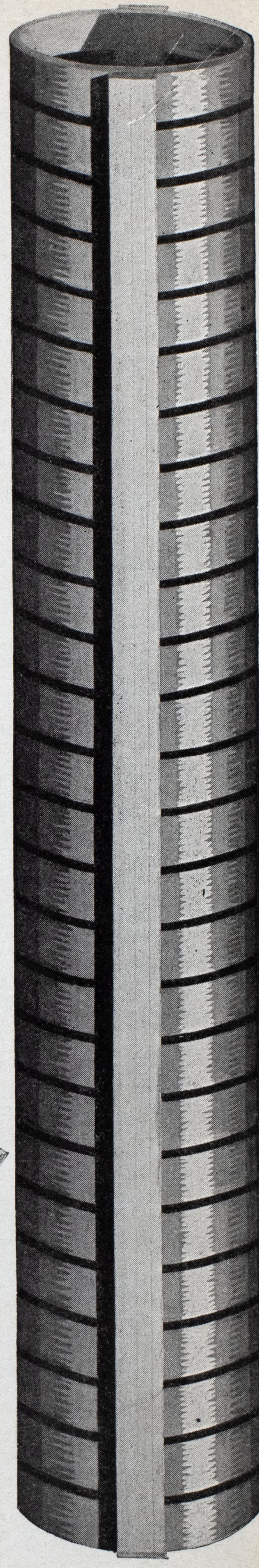
Write for "Facts"

Write today for a copy of the booklet, "Facts for Consideration in Selecting a Storage Battery." Before buying your next battery ask for prices on dependable Exide-Ironclad Batteries.



The rubber tubes of the Exide-Ironclad hold the active material just as the tea ball holds the tea leaves.

This booklet will interest you. Send for it.



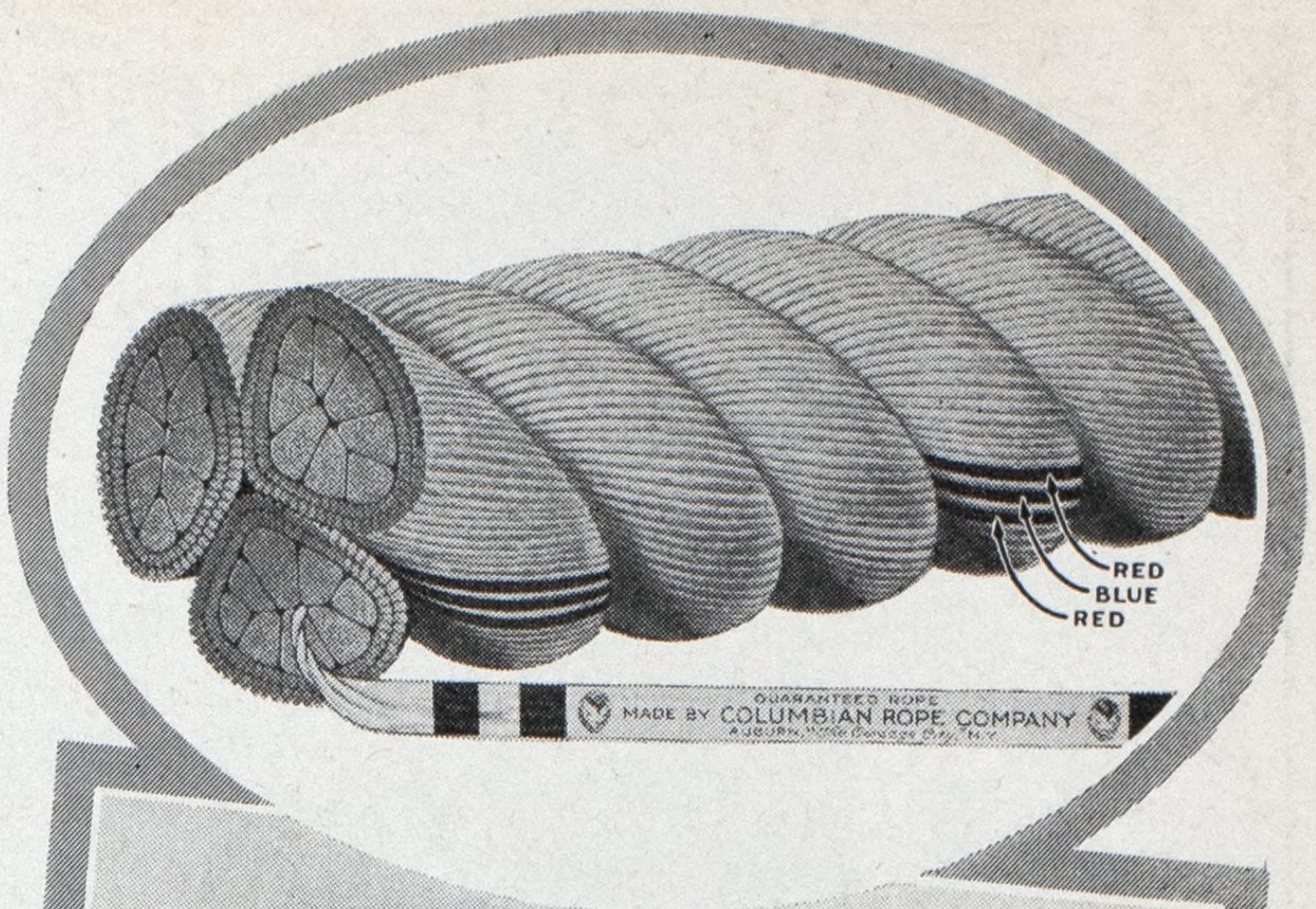
Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

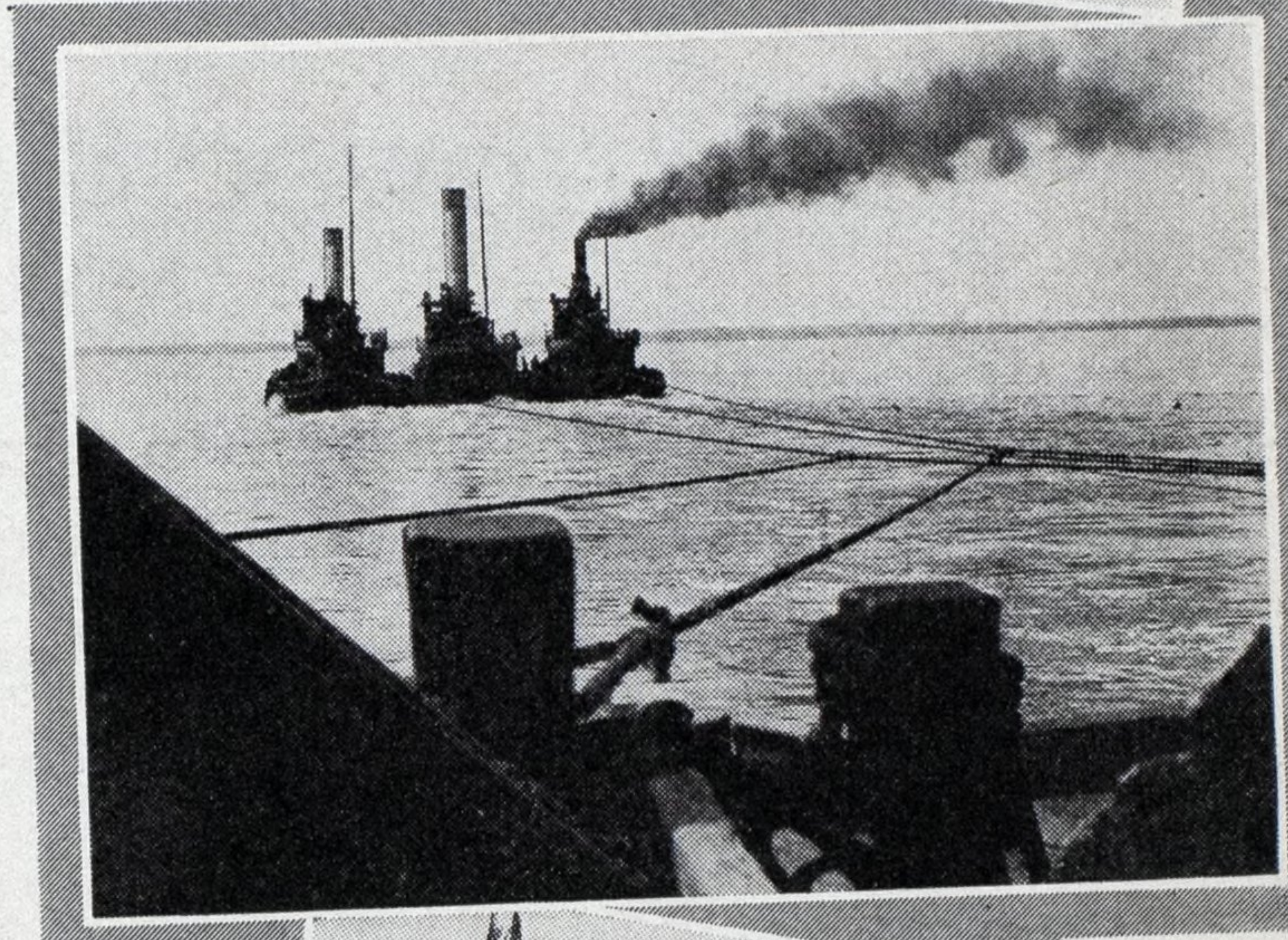
Exide Batteries of Canada, Limited, Toronto

COLUMBIAN TOW-RO



PATENTED

will do any of these jobs Better



It is the towing line of individuality—the only line of its kind and its patented new construction gives it a superior performance.

Just as Columbian engineers have developed Columbian *Tape-Marked* Rope to the point where it is an accepted leader, so have they perfected a line for towing which is also a leader—Columbian Tow-Ro. Its construction is a step forward in towing line manufacture for it offers the user the only perfectly balanced tow line on the market.

The heart of Tow-Ro is composed of large yarns, pretwisted slightly. These have been designed to absorb the shock and stand the pull of the tow and they do it to perfection. Then an extra-tough outside jacket of regular size yarns in a double thickness is used to protect the heart and resist outside abrasive wear.

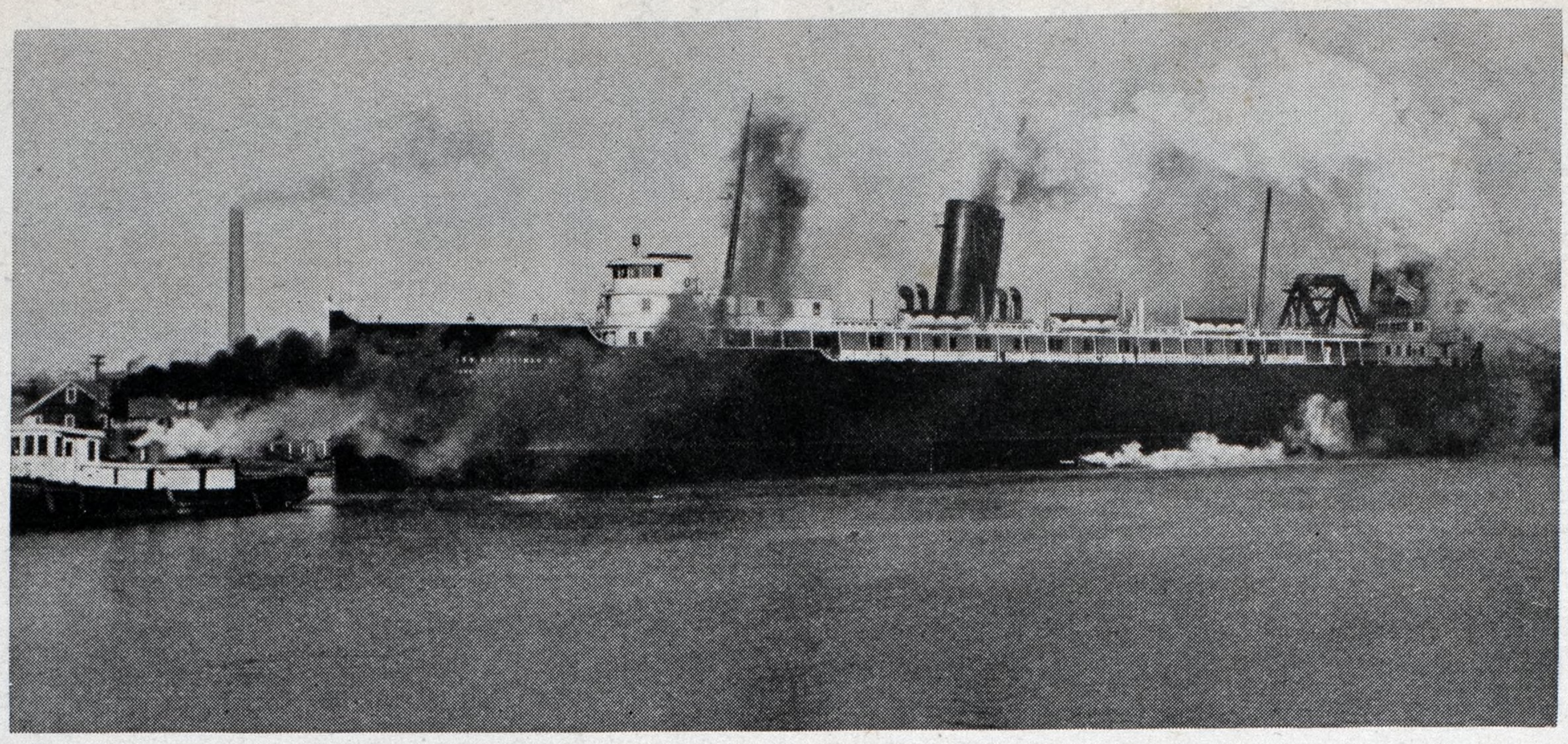
Tow-Ro is waterproofed as only Columbian waterproofs rope. It has flexibility without distortion, it can be easily spliced and is positively guaranteed by the famous *Tape-Marker*. It is also readily identified by the red, white, blue, white and red, surface markers.

No captain likes to pick up a tow at sea, especially during a blow. However, it is necessary at times and when his towing line is Columbian Tow-Ro, he may rest assured that if it is possible to hold a tow, Columbian Tow-Ro will do it.

To get more Towing miles per Line, use Columbian Tow-Ro Pure Manila Rope.

COLUMBIAN ROPE COMPANY
332-90 Genesee Street
Auburn, N. Y. *"The Cordage City"*
Branches— New York Chicago Boston New Orleans Philadelphia

MORE TOWING MILES PER LINE



HERE IS THE CITY OF SAGINAW 31, the turbo electric drive carferry built by us for the Pere Marquette Railway Company. When it comes to designing and building vessels our engineering organization, skilled workmen, and modern facilities guarantee satisfaction to the customer.

We design and build steel passenger and freight vessels, carferries, oil tankers, sand suckers, lighters, dredges, yachts, fire boats, tugs, derricks, scows, marine engines and boilers. At this plant you will find excellent facilities, including a 600′ steel floating dry dock, for ship, engine and boiler repairs.

MANITOWOC SHIPBUILDING CORPORATION

MANITOWOC, WISCONSIN

VECO

Electrical Devices and Wiring Appliances

are

Light Weight — Non-Ferrous

Non-Corrosive—Low Cost

Built to resist rough usage

To stand abnormal wear and salt atmosphere. Approved by the National Board of Underwriters and now are distributed to the Marine Trade by experienced and recognized Marine Electrical Engineers.

FINTUBE RADIATORS

for

Steam, Vacuum, Hot Water, Vapor

and

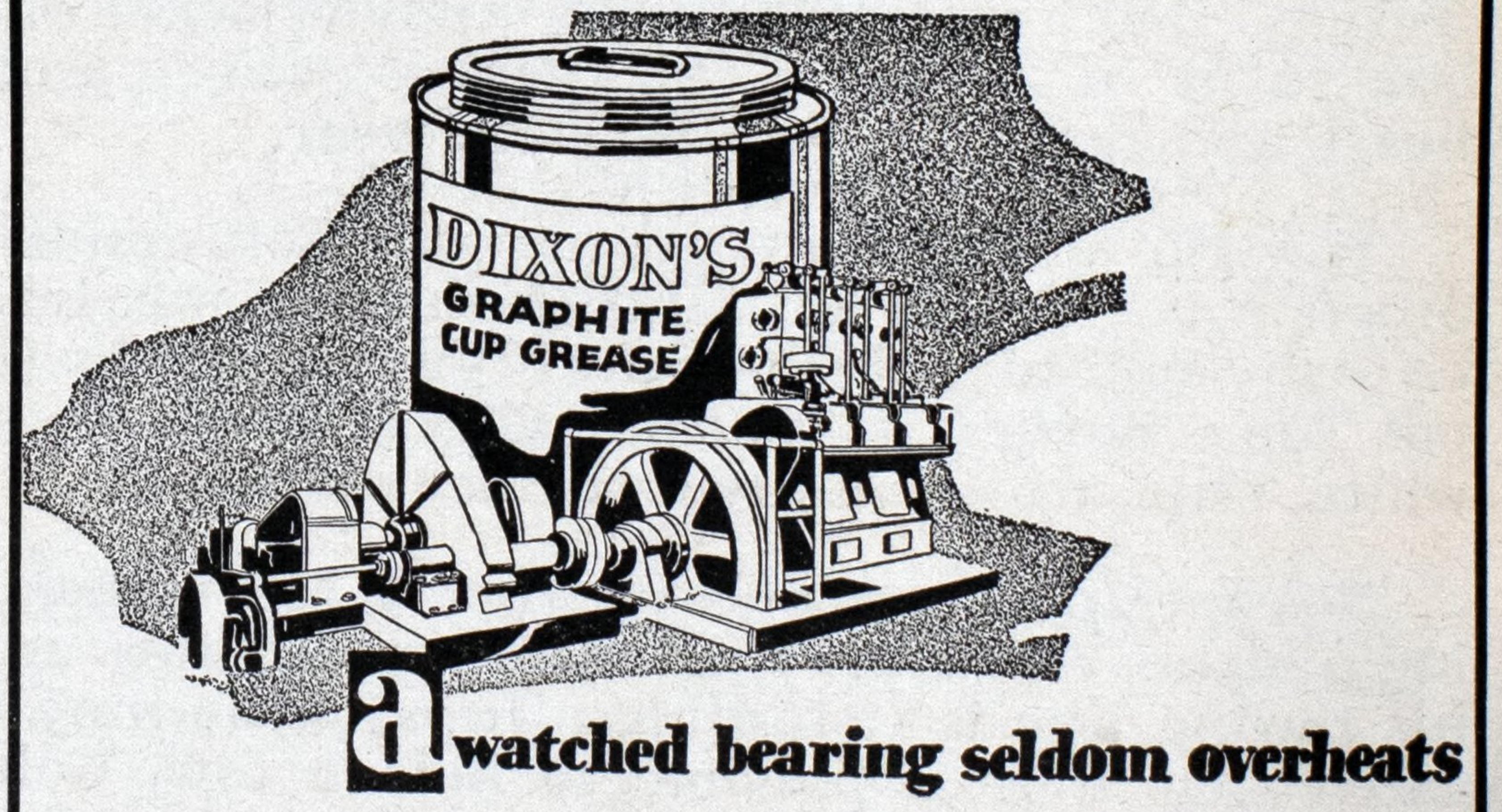
Electric Systems

Save space, weight and fuel—add refinement to any room

Special Marine Types

THE MARR BROTHERS, Inc.

15 PARK ROW, NEW YORK CITY



a watched bearing seldom overheats

But who wants to keep an eye—or a hand—on a bearing to be sure it doesn't, when Dixon's Graphite Cup Grease spreads its cooling, smooth, wear-resisting lubrication to every part of the bearing.

In Dixon's Graphite Cup Grease, finely pulverized Flake Graphite—itself a lubricant—is combined with the finest quality greases. Flake Graphite, brought to the bearing surfaces, takes the load and wear — prevents overheating and scoring. There's economy in such lubrication.

Dixon's Graphite Cup Grease is made in six degrees of hardness—No. 3 is recommended for general use

Give Dixon's Graphite Cup Grease a trial on any bearing—you won't have to nurse it to keep it cool.

Write for Circular No. 81-R

OTHER DIXON GRAPHITE PRODUCTS

Flake Graphite	Belt Dressing
Pipe Joint Compound	Graphite Seal
Waterproof Graphite Grease	Industrial Paint

JOSEPH DIXON CRUCIBLE CO.

Established 1827

Jersey City New Jersey

DIXON'S GRAPHITE CUP GREASE

An Achievement in Research produces new Diesel Values!

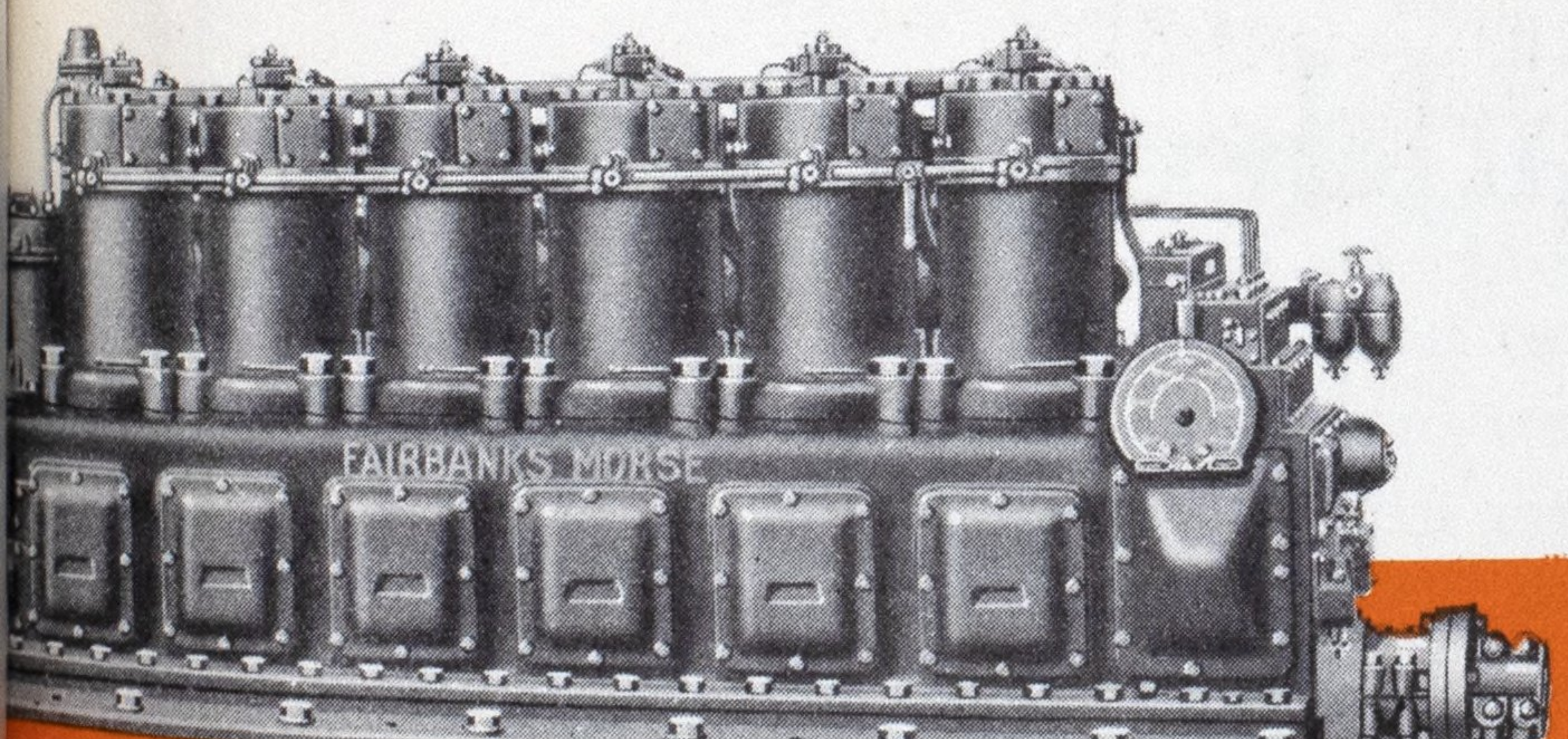
Since the early days of its pioneering, time has brought many changes and new knowledge to the science of Diesel design and construction. The part played by Fairbanks-Morse in this development of the Diesel has been proportionate to its leadership. Through the years millions spent in research have enabled this organization to make those contributions which have established Fairbanks-Morse as America's largest manufacturers of Diesel Engines.

In step with advanced practice in Diesel design, Fairbanks-Morse early recognized the two-cycle, airless-injection type of engine as offering the utmost in simplicity, dependability and over-all operating economy. Today this simpler type engine has attained world-wide recognition of its superiority. Fairbanks-Morse is responsible for its present leadership in America.

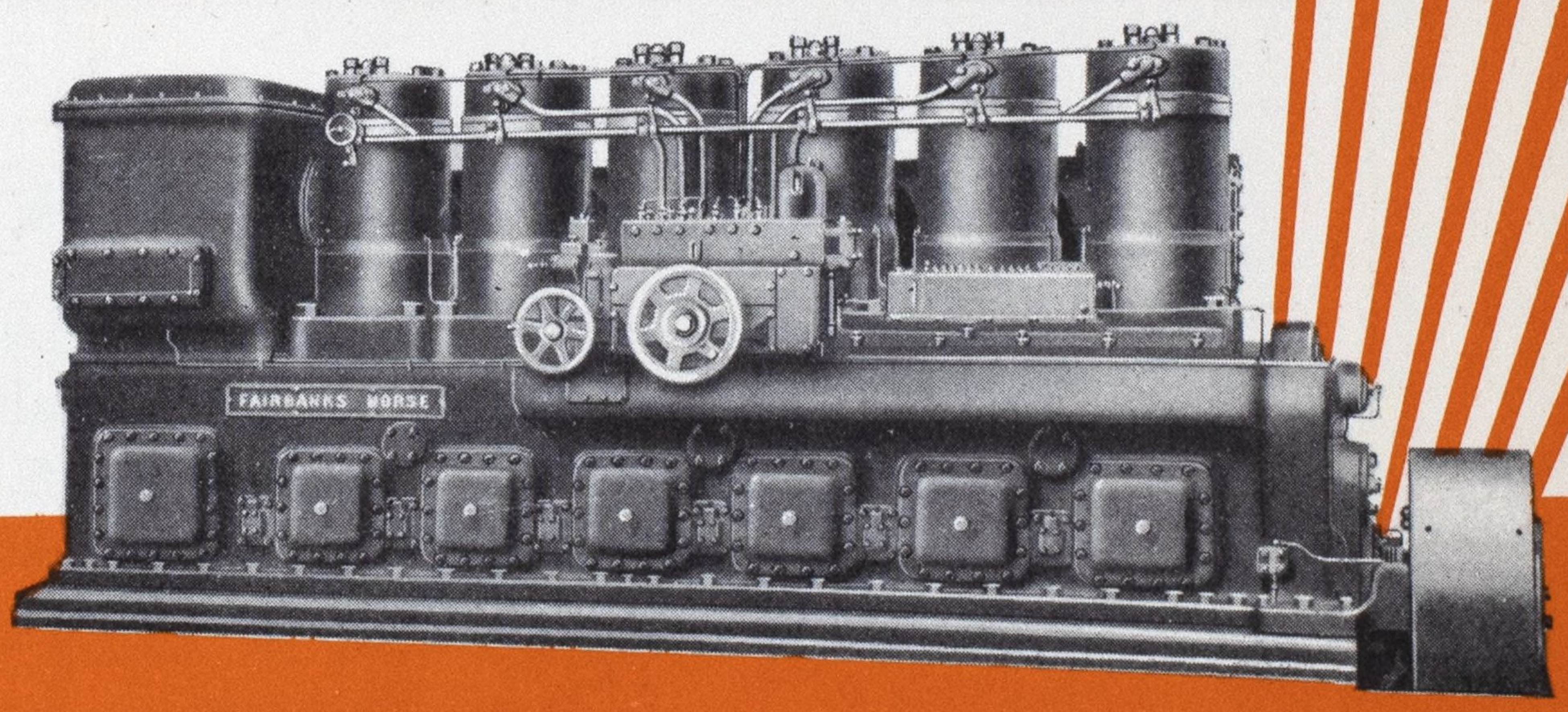
Now, Fairbanks-Morse again offers new improvements which are of major importance to those who are interested in Diesel power. An achievement in research has resulted in remarkable improvement in fuel efficiency of all F-M Diesels.

The result is that the fuel economy of the F-M two-cycle airless-injection engine is unequalled by any other engine of this type. The larger sizes up to 1400 hp. offer such improved efficiencies that the fuel economy of these engines is now unsurpassed by any engine of even more complicated type.

FAIRBANKS, MORSE & CO.
900 S. Wabash Ave., Chicago
Branches with Service Stations in Principal Ports



Cylinder Model 35E 8¾ Direct Reversing Marine Engine

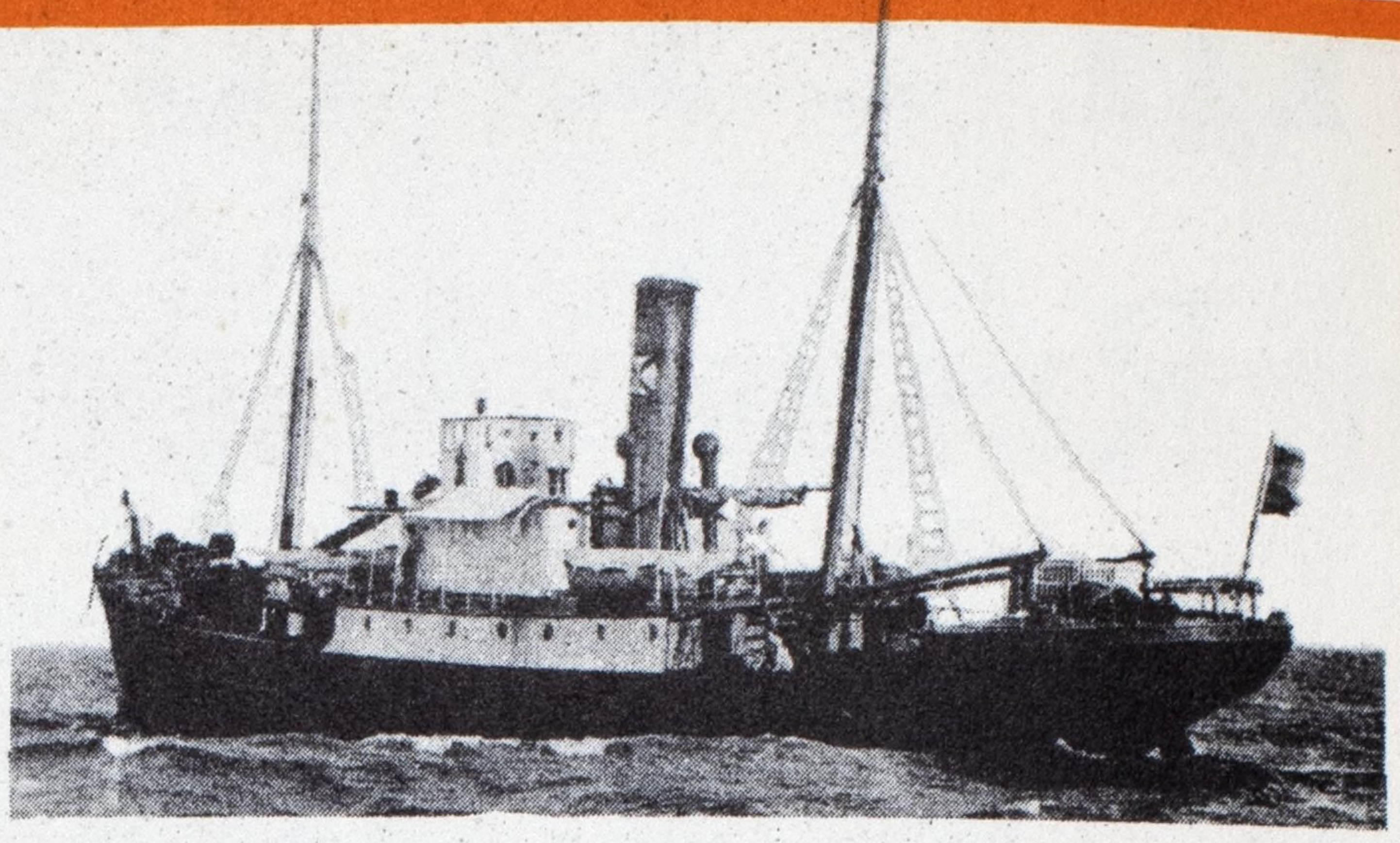


6 Cylinder Model 37 Marine Engine 14" x 17" Cylinder Size

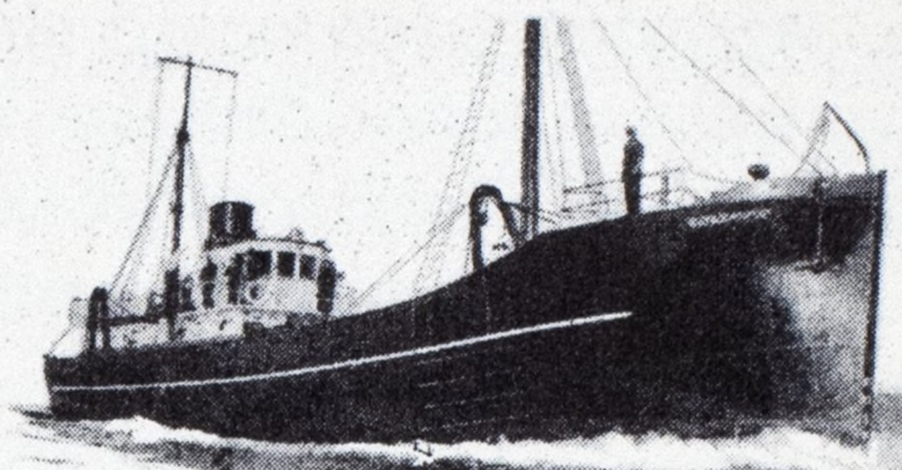
FAIRBANKS-MORSE
DIESEL ENGINES
POWER, PUMPING AND WEIGHING EQUIPMENT

F M

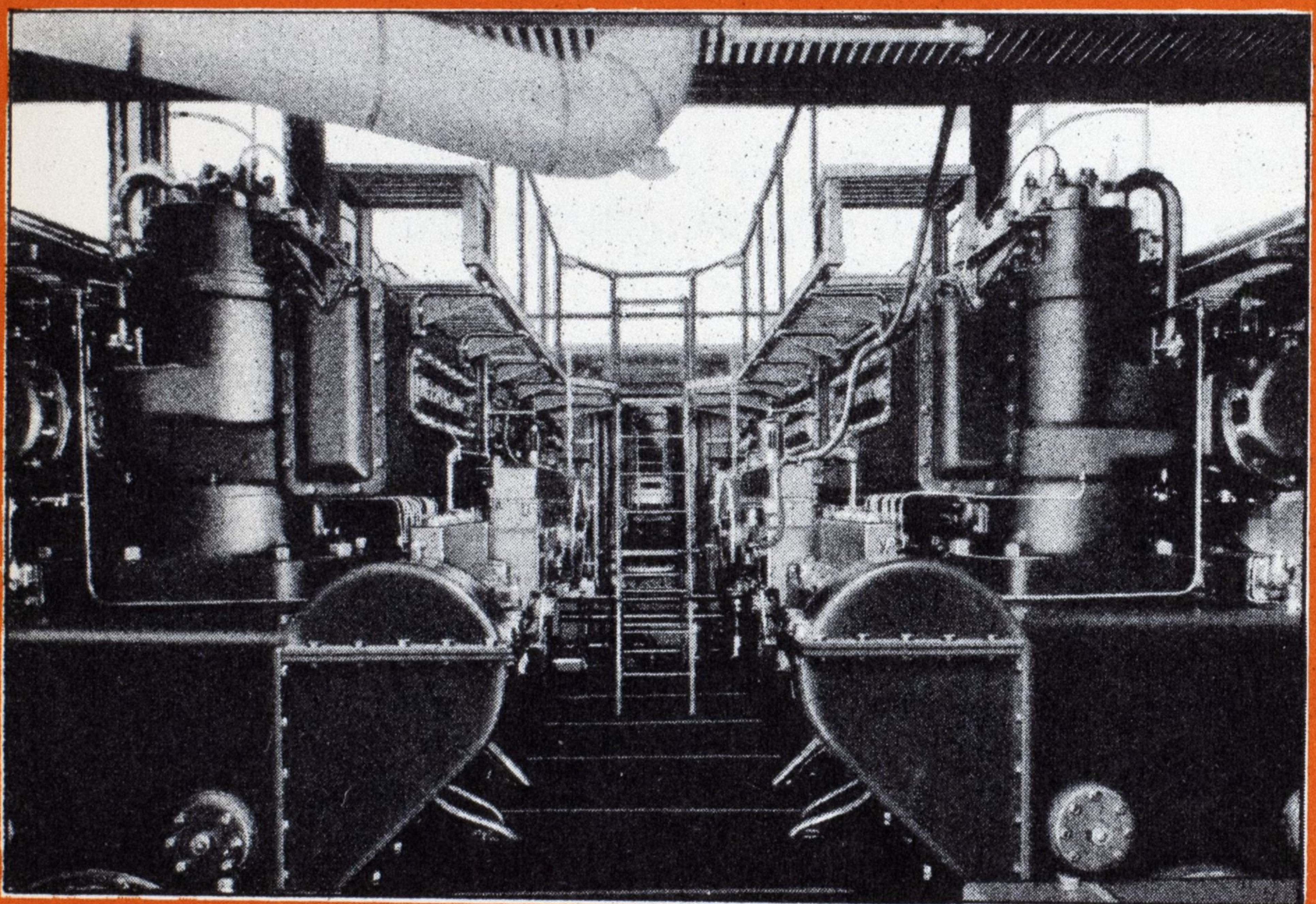
For all types of craft



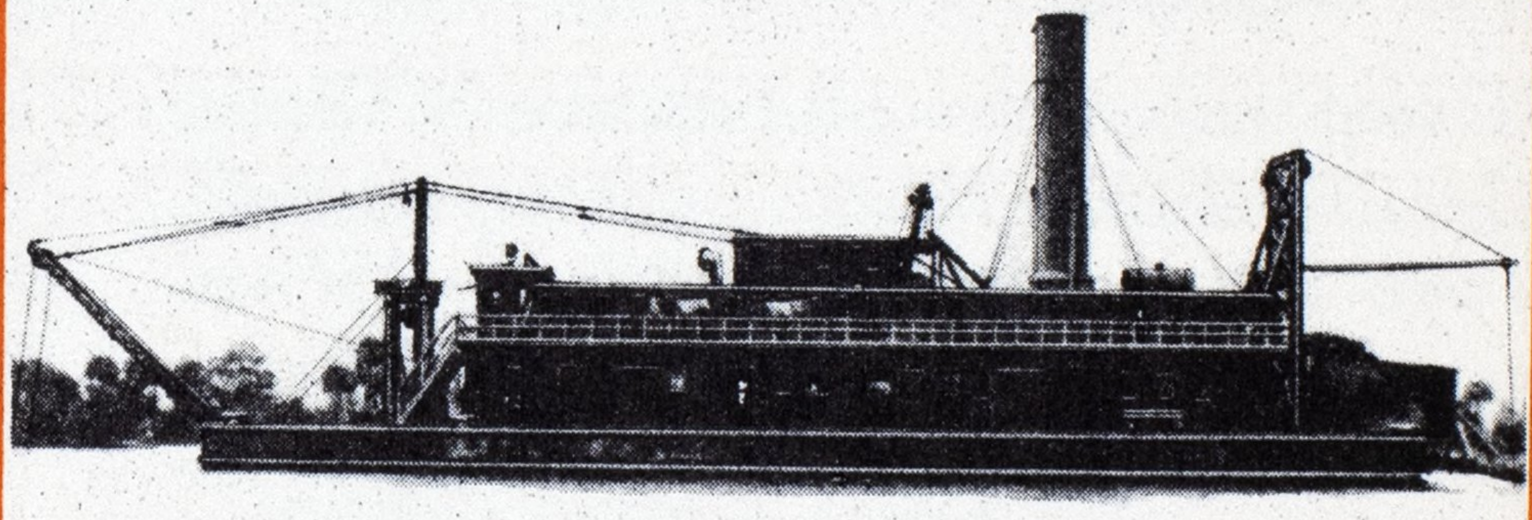
The "San Antonio," a coasting freighter between Montevideo and Buenos Aires has shown increased profits since her steam plant was replaced by a 360 hp. F-M Diesel.



The "Holy Cross" is one of three new trawlers of a standardized F-M Diesel Driven type owned by the Atlantic and Pacific Fish Co. A 360 hp. Diesel for her main power plant and a 120 hp. for operating auxiliaries.



The engine room of the "Mikimiki" a Young Bros. tug. A twin screw job with a 560 hp. F-M Diesel driving each propeller.



The dredge "Davis" owned by the Clark Dredging Co., of Miami. An 840 hp. F-M Diesel drives the 20-inch dredge pump.

F-M Diesels offer added profits

1. Lower fuel costs. 2. Less maintenance (no boiler troubles). 3. No fuel costs when tied up at the dock. 4. Smaller crew in the engine room. 5. More space in the hold for paying cargo. 6. Longer cruising radius. 7. Less idle time for the vessel for refueling, repairs, etc.

FAIRBANKS, MORSE & CO., 900 S. Wabash Avenue, Chicago

Branches with Service Stations in Principal Ports

OA27.329

F M

FAIRBANKS-MORSE

DIESEL ENGINES

POWER, PUMPING AND WEIGHING EQUIPMENT

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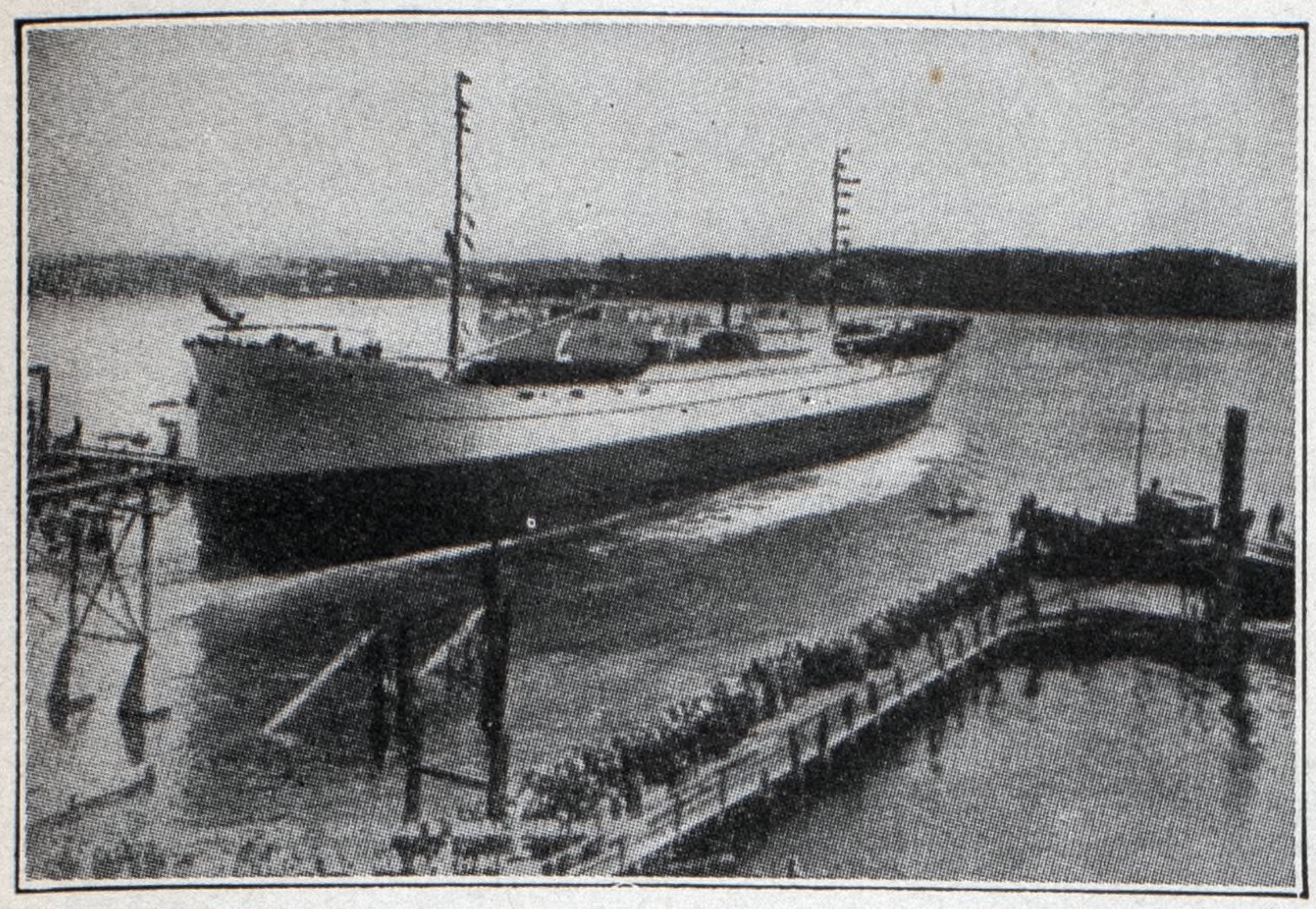

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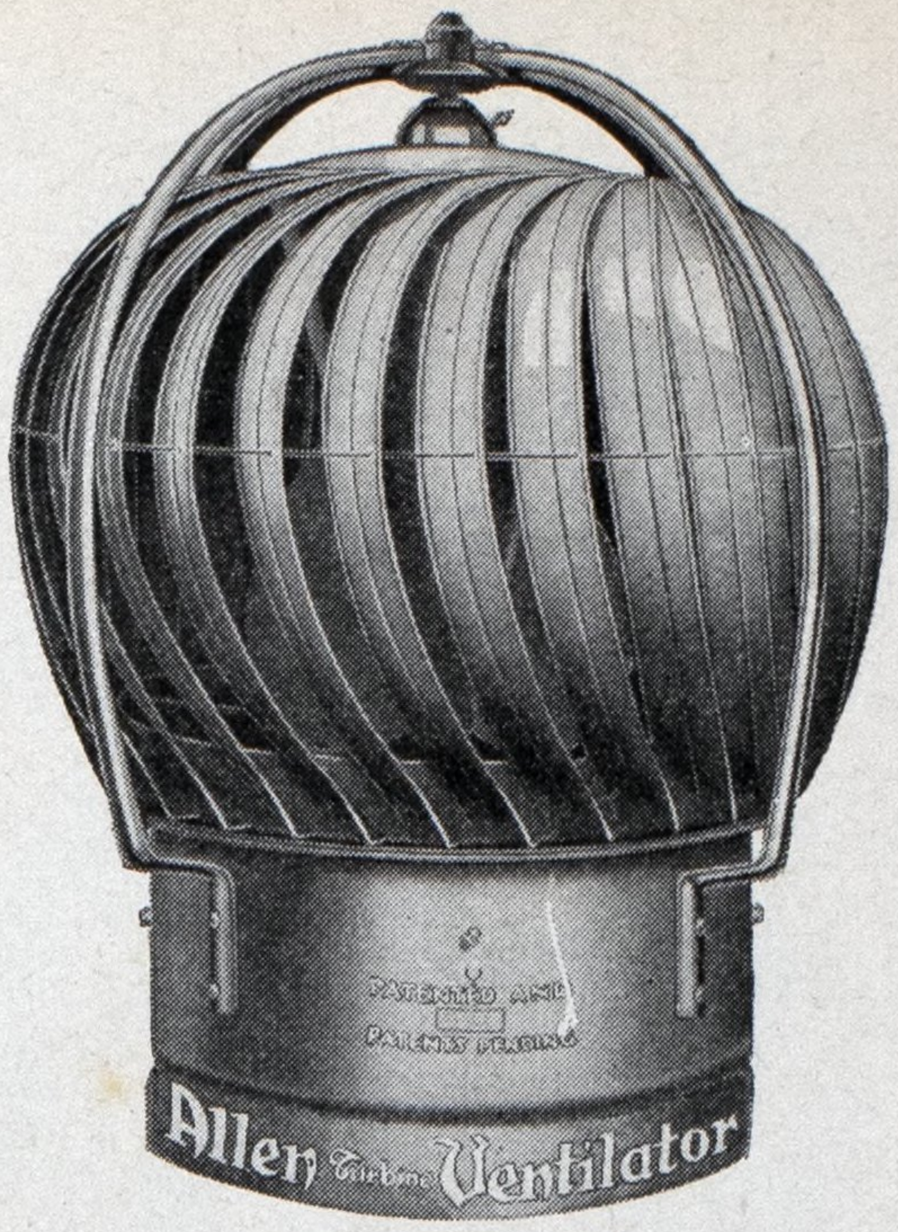

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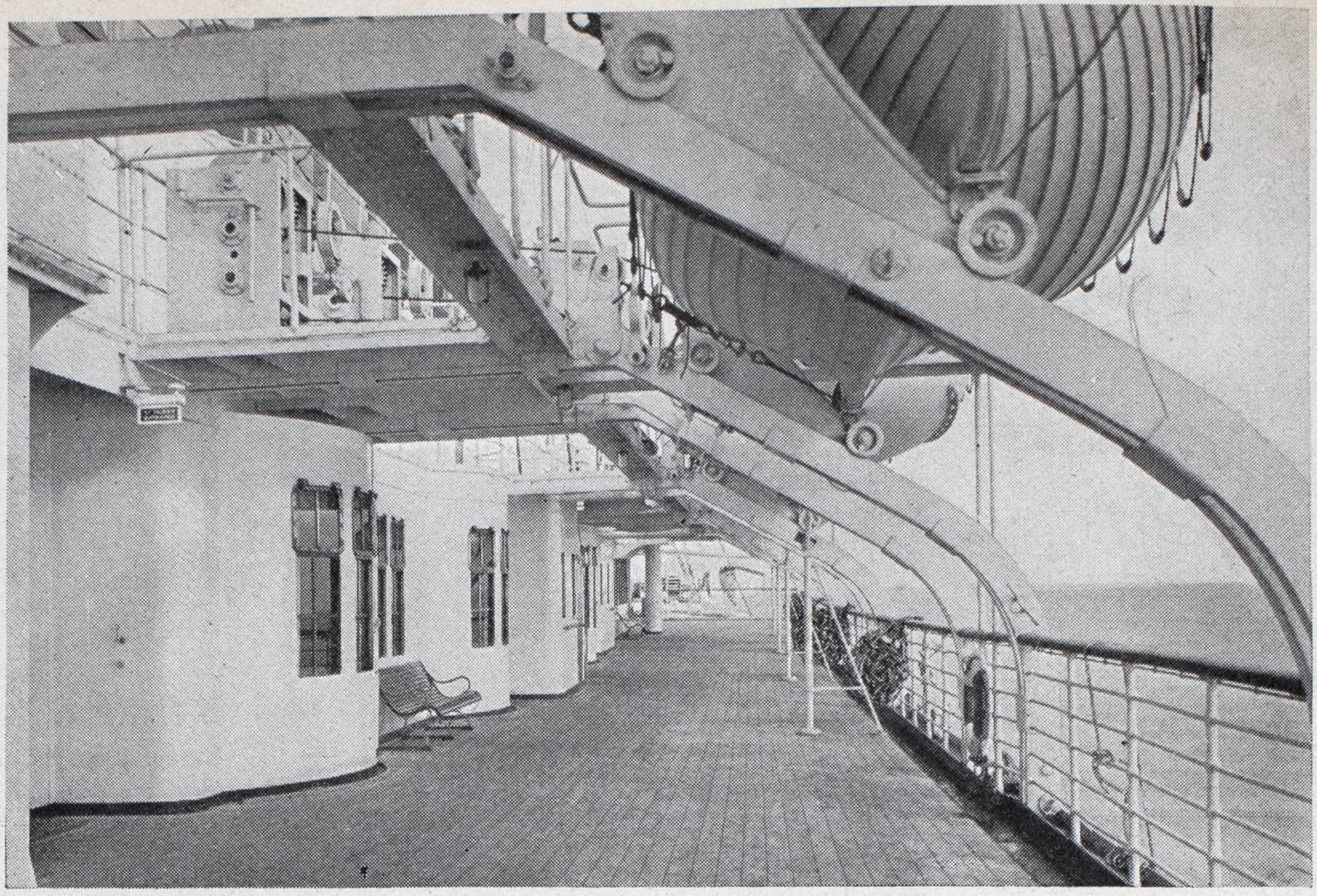

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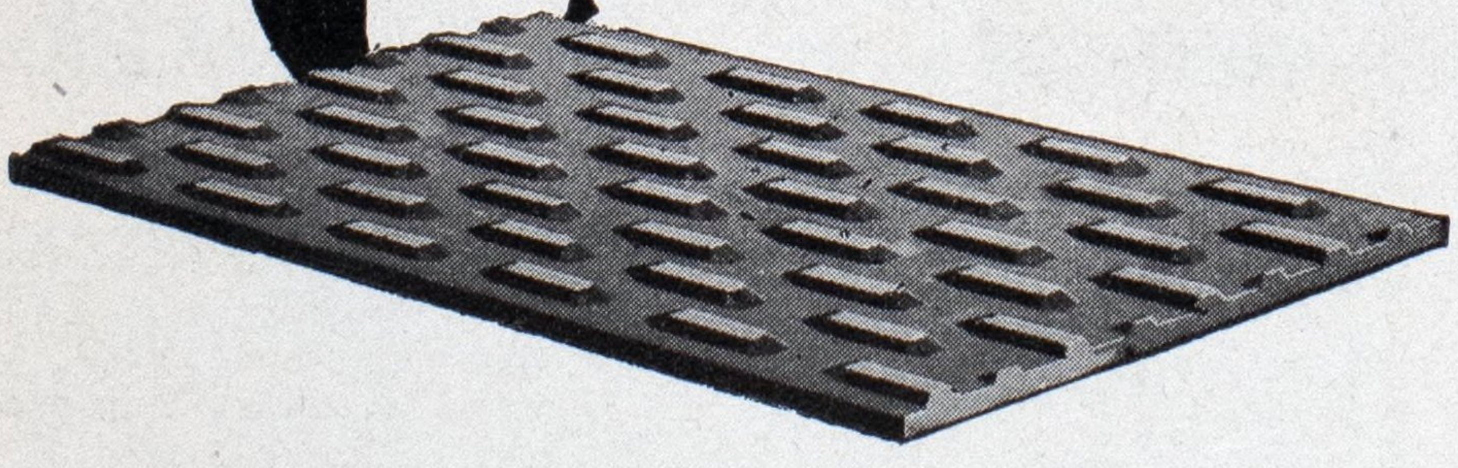

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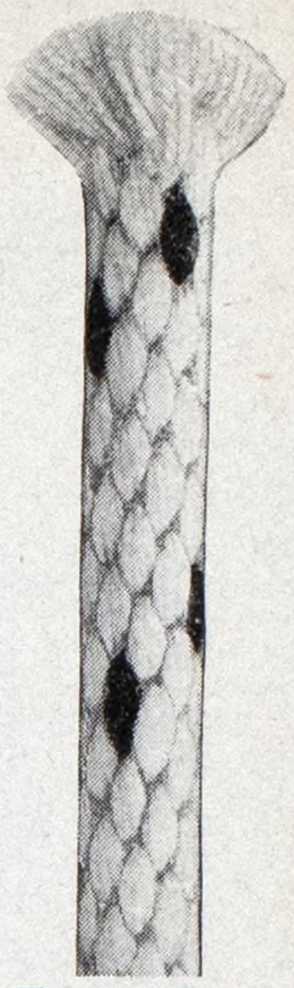

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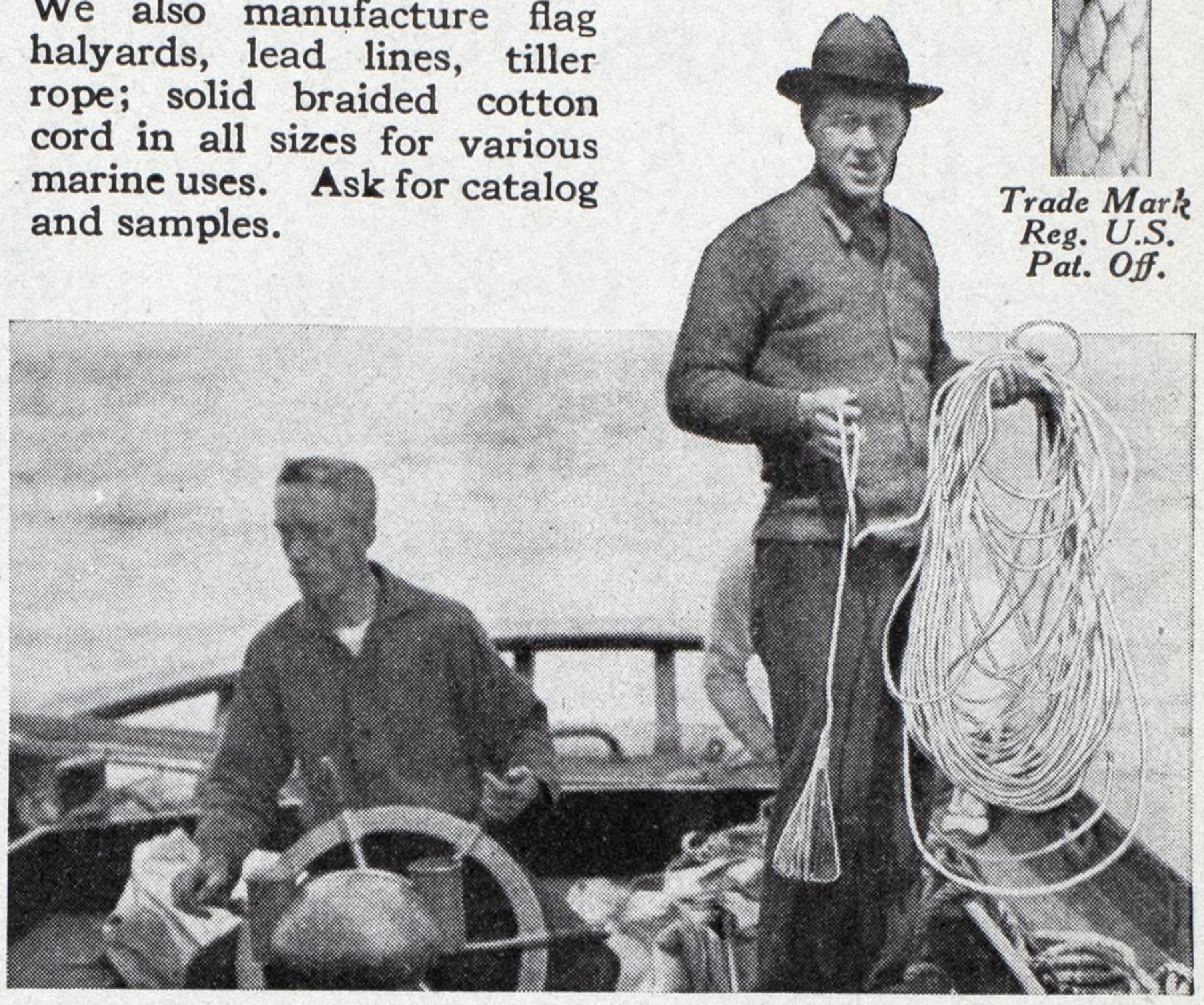

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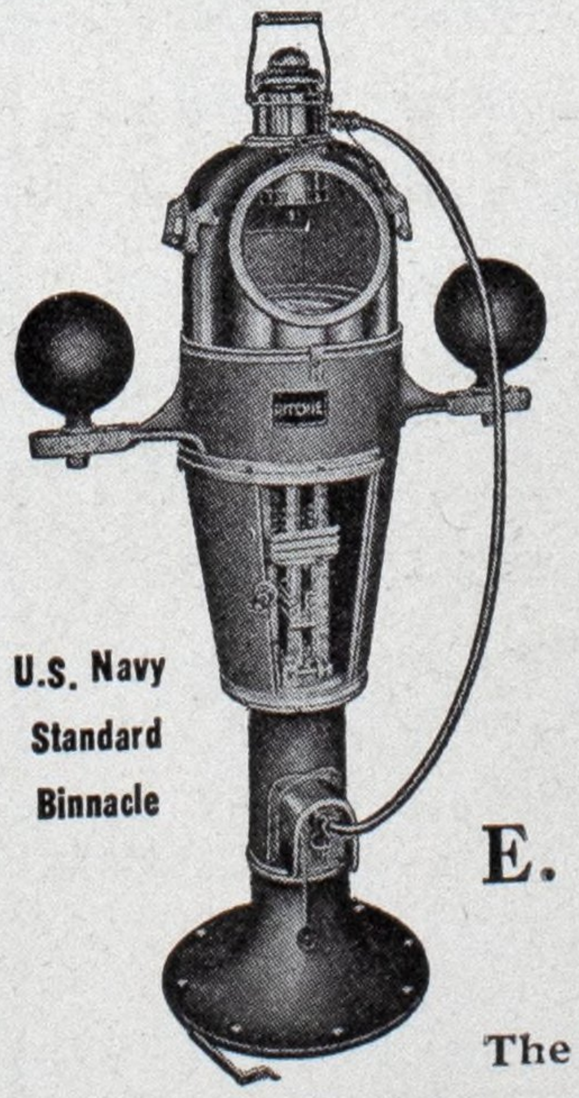

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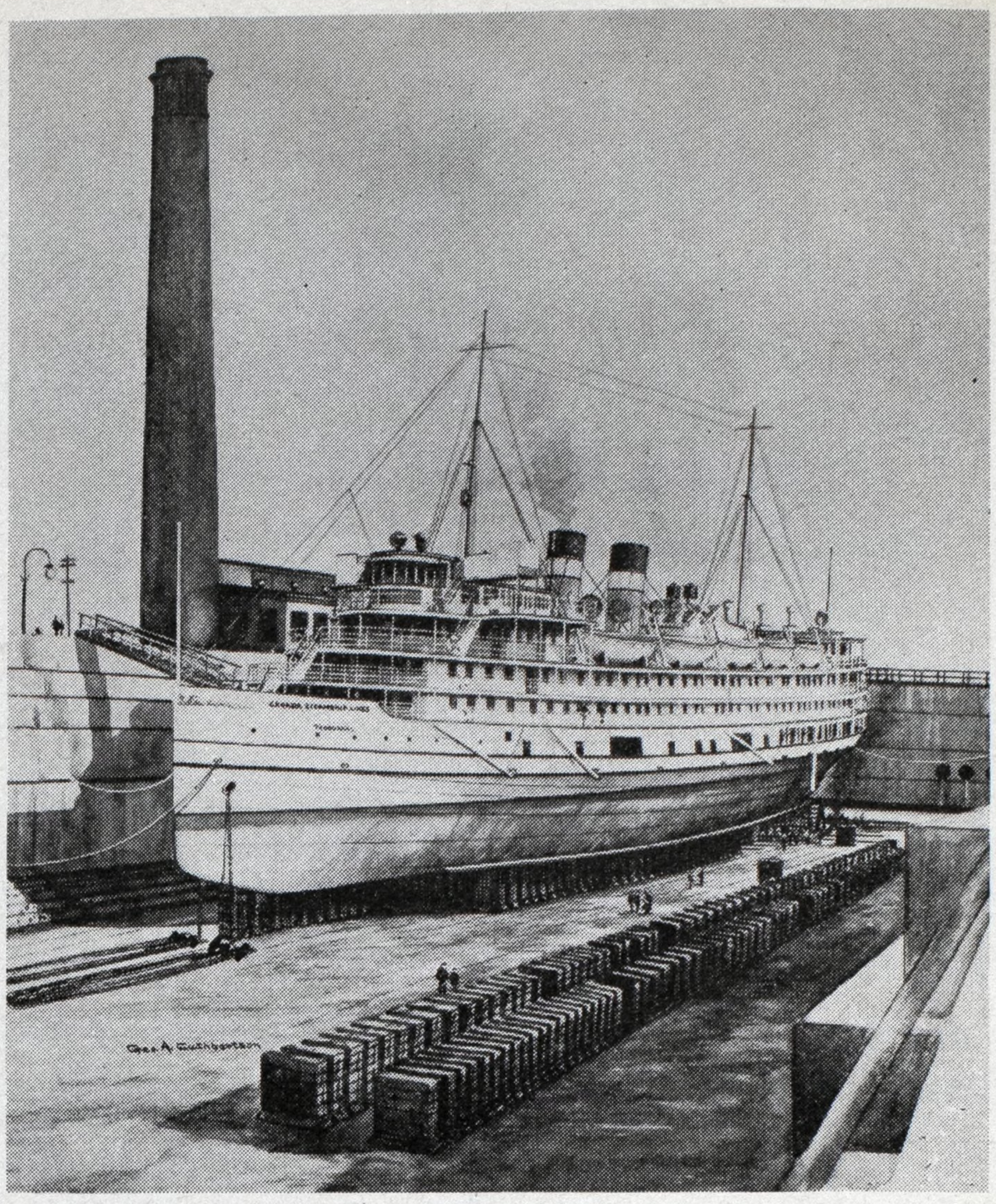

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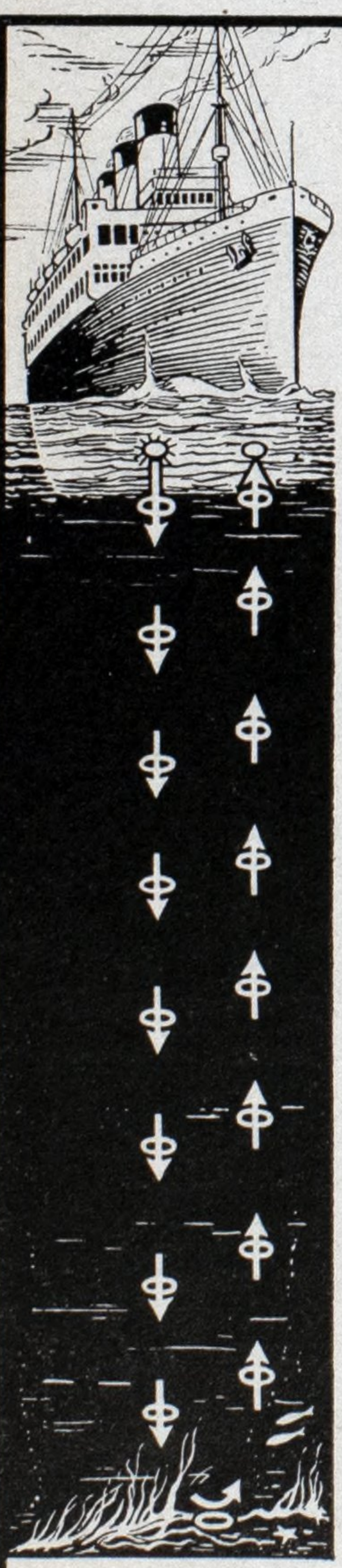

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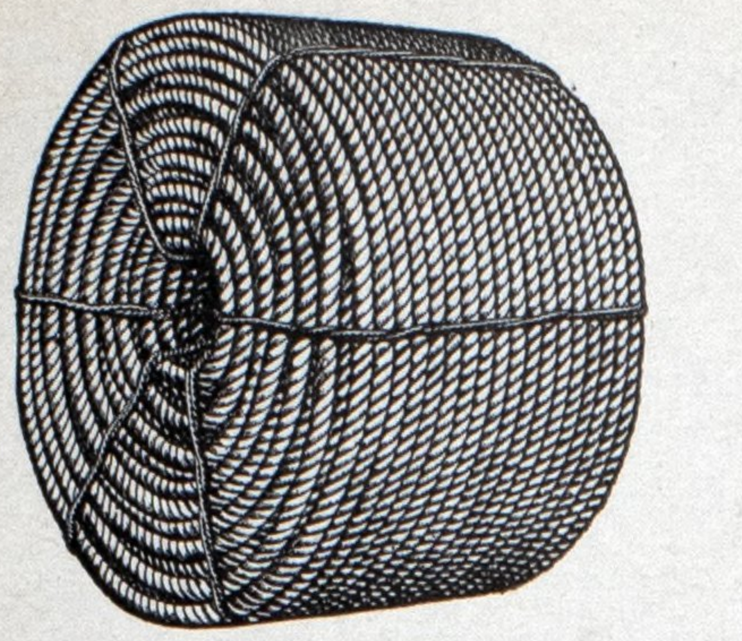

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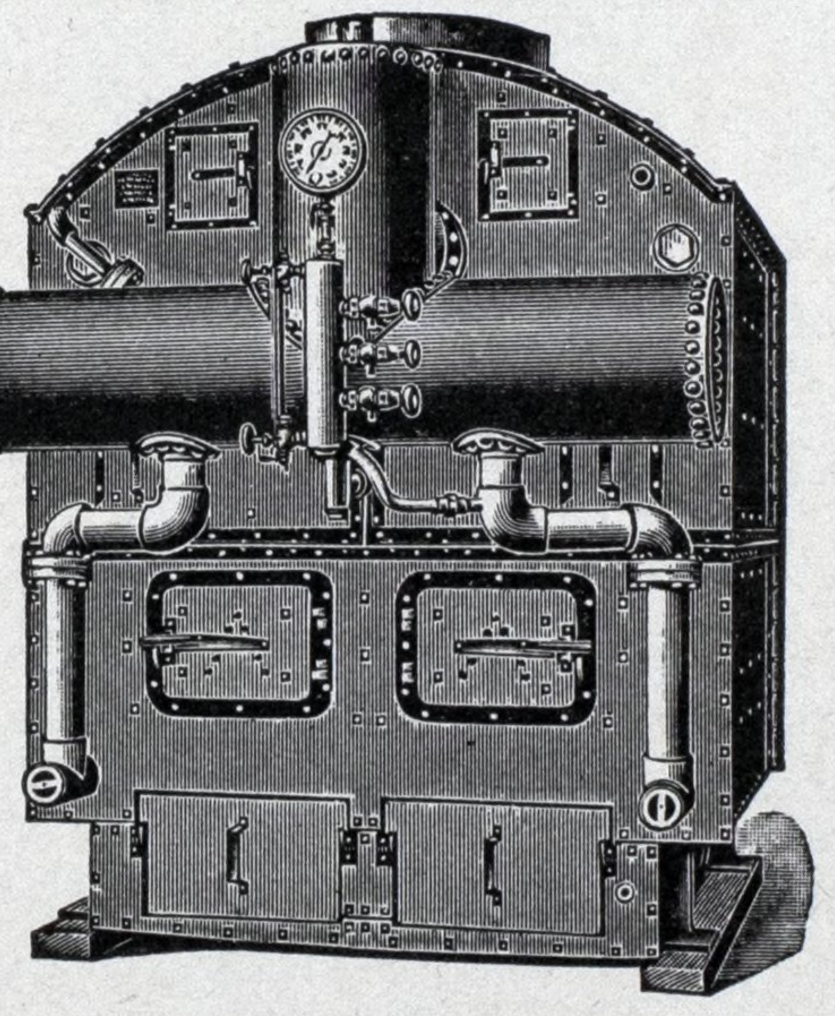

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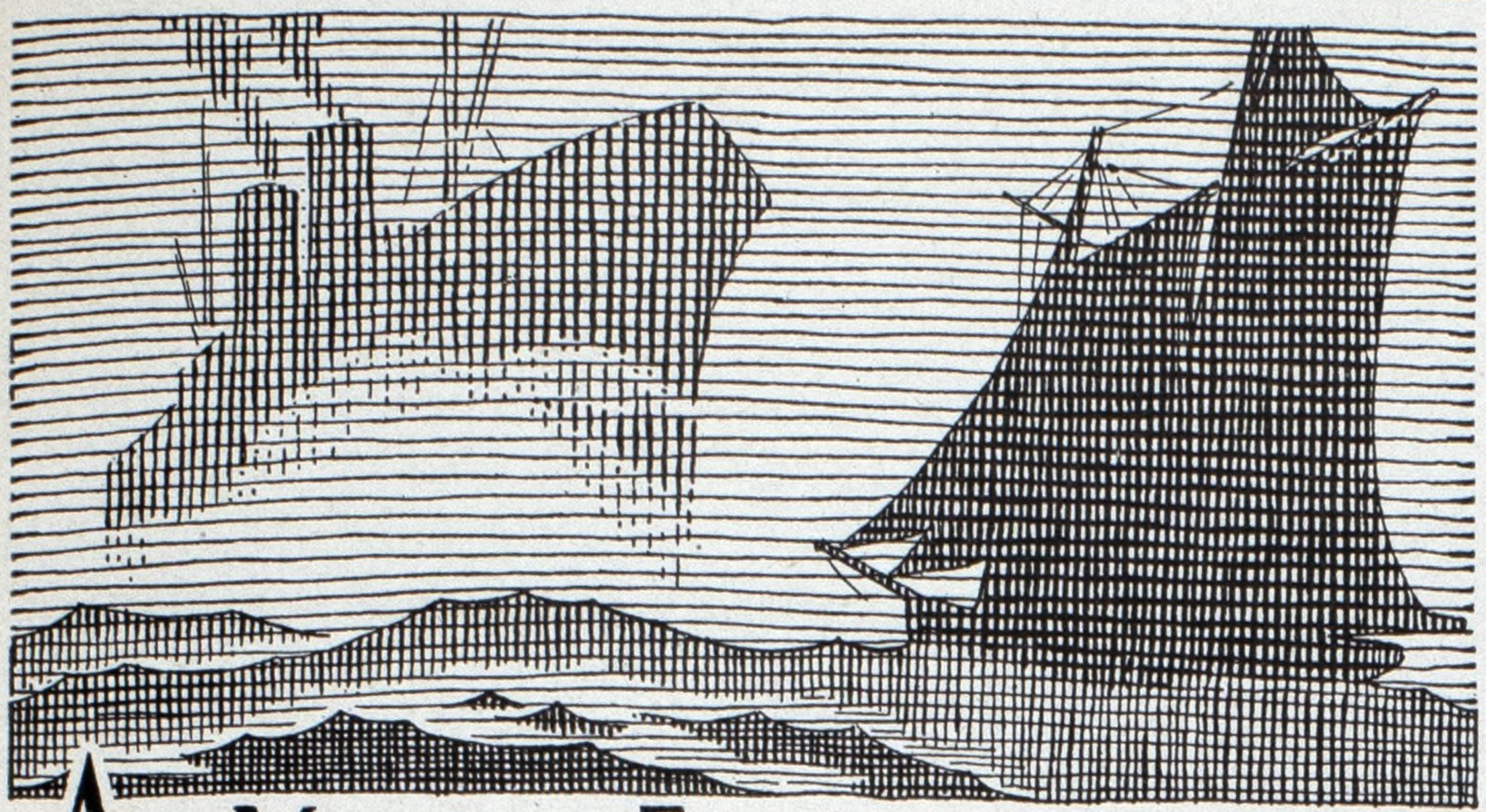

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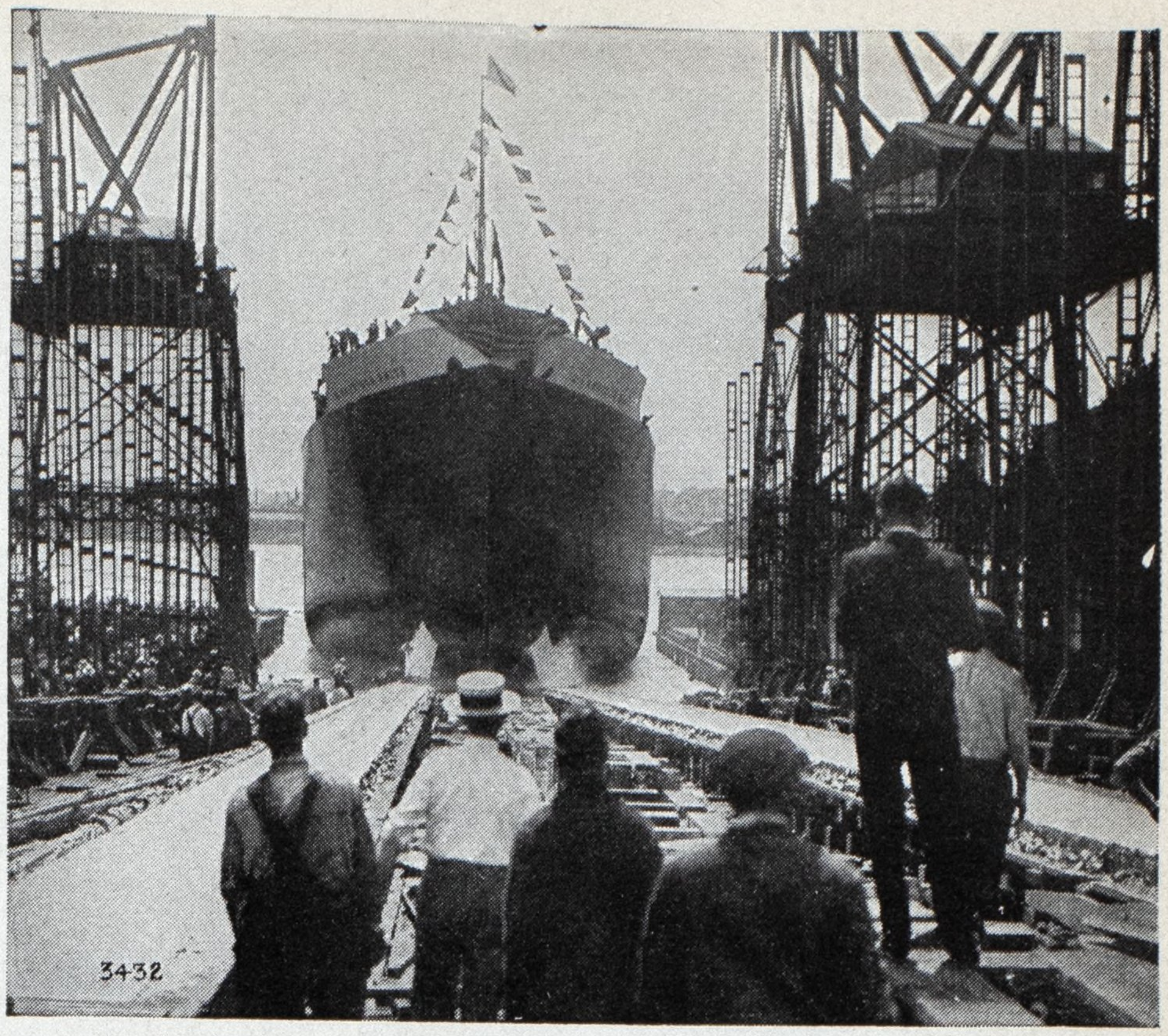

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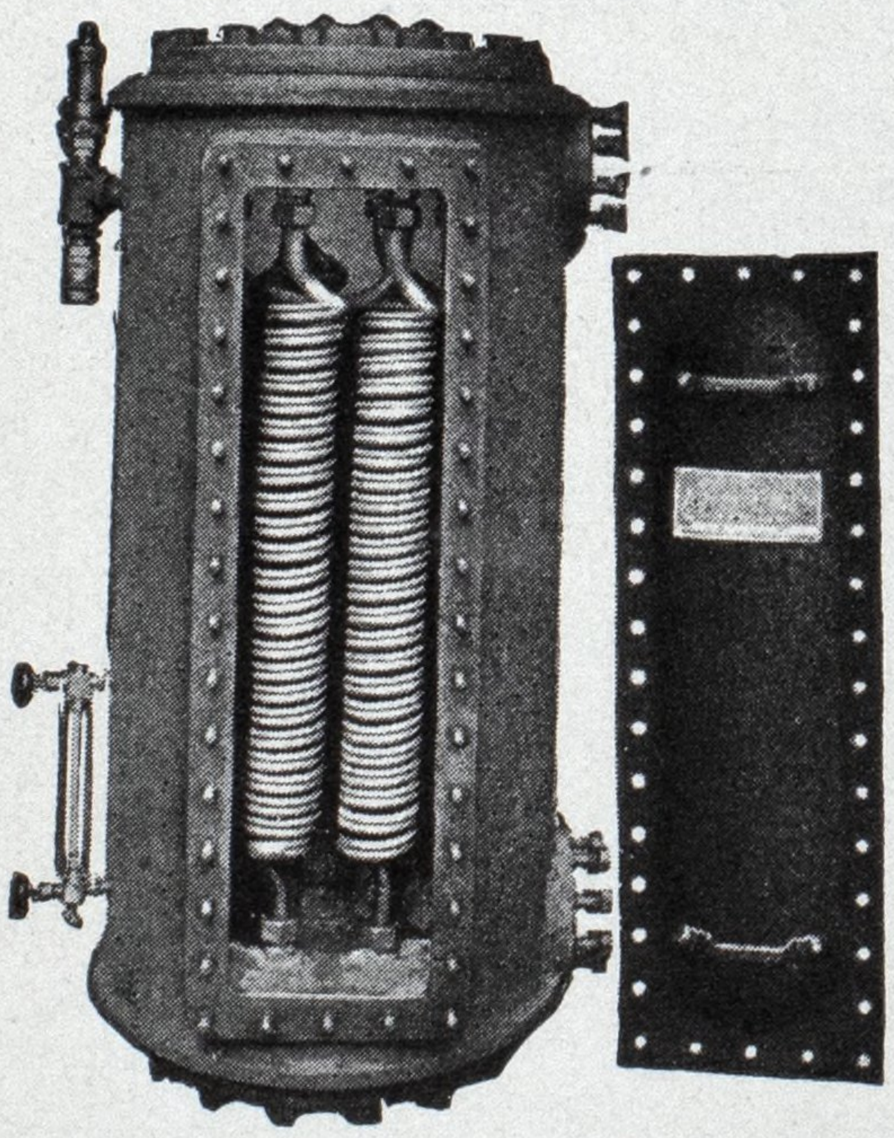

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American Shipbuilding Co., Foot of W. 54th St., Cleveland.
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Canada Steamship Lines, P. O. Box 2430, Montreal, Can.
Cooper-Bessemer Corp., The, Grove City, Pa.
Electric Boat Co.-New London Ship & Engine Works, 247 Park Ave., New York City.
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
McIntosh & Seymour Corp., Auburn, N. Y.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
New York Shipbuilding Co., Camden, N. J.
Sturtevant, B. F., Co., Inc., Hyde Park, Boston, Mass.
Sun Shipbuilding & Dry Dock Co., Chester, Pa.
Todd Shipyards Corp., 25 Broadway, New York City
Toledo Shipbuilding Co., Toledo, O.
United Dry Docks, Inc., 11 Broadway, New York City.

ENGINES (Oil)
Busch-Sulzer Bros.-Diesel Engine Co., 2nd and Utah Sts., St. Louis, Mo.
Cooper-Bessemer Corp., The, Grove City, Pa.
Electric Boat Co.-New London Ship & Engine Works, 247 Park Ave., New York City.
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11Broadway, New York City.
Lombard Governor Co., The, Ashland, Mass.
McIntosh & Seymour Corp., Auburn, N. Y.
Standard Motor Construction Co., 172 Whiton St., Jersey City, N. J.
Sun Shipbuilding & Dry Dock Co., Chester, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

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Dake Engine Co., Grand Haven, Mich.

EUROPEAN STEAMSHIP LINES (Passenger and Freight)
Hamburg-American Line 39 Broadway, New York City.

EVAPORATORS
Griscom-Russell Co., 285 Madison Ave., New York City.

FANS (Electric)
General Electric Co., Schenectady, N. Y.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., S. Philadelphia, Pa.

FEED WATER HEATERS—See HEATERS AND PURIFIERS (Feed Water)

FEED WATER REGULATORS
Babcock & Wilcox Co., 85 Liberty St., New York City.

FIRE BRICK
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

FLOODLIGHTS (Acetylene)
Oxweld Acetylene Co., The, 30 E. 42nd St., New York City.

FLOORING
Selby, Battersby & Co., 33rd & Arch Sts., Philadelphia.

FLOORING—STEEL (Ventilating, Non-Slipping, Fireproof)
Dravo Contracting Co., Neville Island, Pittsburgh, Pa.

FLOOR PLATES
Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

FORGINGS
Erie Forge Co., 15th and Cascade Sts., Erie, Pa.

FOUNDERS
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
New York Shipbuilding Co., Camden, N. J.

FREIGHT SERVICE
Hamburg-American Line, 39 Broadway, New York City.

FUEL OIL
Standard Oil Co. of New Jersey, 26 Broadway, New York City.
Vacuum Oil Co., 61 Broadway, New York City.

FURNITURE (Metal)
Simmons Co., The, 666 Lake Shore Drive, Chicago, Ill.

GALLEY RANGES
Stamford Foundry Co., Stamford, Conn.

GEARS (Marine Equipment)
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

GENERATING SETS
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.

GENERATING SETS (Direct Connected)
General Electric Co., Schenectady, N. Y.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

GENERATORS
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., S. Philadelphia, Pa.

GRAPHITE
Dixon, Jos., Crucible Co., Jersey City, N. J.

GRAPHITE GREASES
Dixon, Jos., Crucible Co., Jersey City, N. J.

GRAPHITE PAINT
Dixon, Jos., Crucible Co., Jersey City, N. J.

GRAPHITE PIPE JOINT COMPOUNDS
Dixon, Jos., Crucible Co., Jersey City, N. J.

GRATINGS (Steel)
Dravo Contracting Co., Neville Island, Pittsburgh, Pa.

GRATINGS AND TREADS
Dravo Contracting Co., Neville Island, Pittsburgh, Pa.

GREASE
Vacuum Oil Co., 61 Broadway, New York City.

GREASE (Launching)
Vacuum Oil Co., 61 Broadway, New York City

GYPSEYS
American Engineering Co., Cumberland & Arimingo Sts., Philadelphia, Pa.

GYRO-PILOT (Automatic Steering)
Sperry Gyroscope Co., The, Brooklyn, N. Y.

HATCH FASTENERS
Mullholland Hatch-Fastener Co., Marion Bldg., Cleveland, O.

HAWSERS (Manila)
Columbian Rope Co., Auburn, N. Y.
Samson Cordage Works, Boston.
Whitlock Cordage Co., 46 South St., New York City.

HEATERS AND PURIFIERS (Feed Water)
Davis Engineering Co., 90 West St., New York City.
Griscom-Russell Co., 285 Madison Ave., New York City.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

HEATING EQUIPMENT
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., S. Philadelphia, Pa.

HEATING STOVES
Stamford Foundry Co., Stamford, Conn.

HOISTING ENGINES
Hyde Windlass Co., Bath, Me.

HOISTS (Air)
American Shipbuilding Co., Foot of W. 54th St., Cleveland.
Ingersoll-Rand Co., 11 Broadway, New York City

HOISTS (Electric, Pneumatic, Hand)
American Engineering Co., Cumberland & Aramingo Sts., Philadelphia, Pa.

INDICATORS (Direction & Revolution)
Sperry Gyroscope Co., The, Brooklyn, N. Y.

INDICATORS (Helm Angle)
Sperry Gyroscope Co., The, Brooklyn, N. Y.

INDICATORS (Speed)
Sperry Gyroscope Co., The, Brooklyn, N. Y.

ICE MACHINES—See REFRIGERATING MACHINERY

INSURANCE (Marine)
Boland & Cornelius, Marine Trust Bldg., Buffalo, N. Y.

LAMPS (Mazda and Arc)
General Electric Co., Schenectady, N. Y.

LIFEBOATS
Lane, C. M., Lifeboat Co., Inc., 856 Humboldt St., Brooklyn, N. Y.
Welin Davit & Boat Corp., 3-5 Vernon Ave., Long Island City, N. Y.

LIFESAVING EQUIPMENT
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LIGHTING EQUIPMENT
Westinghouse Electric & Mfg. Co. S. Philadelphia, Pa.

LUBRICATING OIL
Standard Oil Co., of New Jersey, 26 Broadway, New York City.
Vacuum Oil Co., 61 Broadway, New York City.

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American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Cooper-Bessemer Corp., The, Grove City, Pa.
Great Lakes Engineering Works, River Rouge, Mich.
Manitowoc Ship Building Corp., Manitowoc, Wis.
Maryland Dry Dock Co., Baltimore Md.
Toledo Shipbuilding Co., Toledo, O.

MACHINES (Sounding)
Submarine Signal Co., 160 State St., Boston, Mass.

MACHINISTS
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Busch-Sulzer Bros.-Diesel Engine Co., 2nd & Utah Sts., St. Louis, Mo.
New York Shipbuilding Co., Camden, N. J.

MAGNETS (Lifting)
Cutler-Hammer, Inc., 1265 St. Paul Avenue, Milwaukee, Wis.

MANILA OAKUM—See OAKUM (Marine, Rope, Packings, Plumbers)

MATERIAL HANDLING EQUIPMENT
Smith, Leathem D., Dock Co., Sturgeon Bay, Wis.

MATTRESSES
Simmons Co., The, 666 Lake Shore Drive, Chicago, Ill.

METERS (Gas & Air)
Cutler-Hammer, Inc., 1265 St. Paul Avenue, Milwaukee, Wis.

MOTOR GENERATOR SETS
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Troy Engine & Machine Co., Troy, Pa.
Westinghouse Electric & Mfg. Co., S. Philadelphia, Pa.

MOTORS (Electric)
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

NAUTICAL INSTRUMENTS
Ritchie, E. S., & Sons, Brookline, Mass.
Sperry Gyroscope Co., The, Brooklyn, N. Y.

NAVIGATING INSTRUMENTS
White, Kelvin & Wilfrid O., Co., 112 State St., Boston, Mass.

NEON
Linde Air Products Co., The, 30 E. 42nd St., New York City.

NITROGEN
Linde Air Products Co., 30 East 42nd St., New York City

OAKUM (Marine, Rope, Packings, Plumbers)
Stratford, George, Oakum Co., 165 Cornelison Ave., Jersey City, N. J.

OIL BURNING EQUIPMENT
Babcock & Wilcox Co., 85 Liberty St., New York City.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Coen Co., Inc., 610 S. Broadway, Los Angeles, Cal.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

OIL CLARIFIERS
Sharples Specialty Co., Westmoreland, Philadelphia, Pa.

OIL PURIFIERS
Sharples Specialty Co., Westmoreland, Philadelphia, Pa.

OIL FOR ALL PURPOSES (Marine)
Vacuum Oil Co., 61 Broadway, New York City.

OXY-ACETYLENE APPARATUS
Oxweld Acetylene Co., The, 30 E. 42nd St., New York City

OXYGEN
Linde Air Products Co., 30 East 42nd St., New York City.

PASSENGER SERVICE
Hamburg-American Line, 39 Broadway, New York City.

POWDERED COAL BURNERS
Coen Co., Inc., 610 S. Broadway, Los Angeles, Cal.

PROPELLER BLADES AND HUBS
Sheriffs Mfg. Co., Milwaukee, Wis.

PROPELLER WHEELS
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Great Lakes Engineering Works, River Rouge, Mich.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
Sheriffs Mfg. Co., Milwaukee, Wis.
Toledo Shipbuilding Co., Toledo, O.

PROPELLERS
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Hyde Windlass Co., Bath, Me.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.

PULVERIZED COAL BURNERS
Fuller-Lehigh Co., Fullerton, Pa.
Todd Shipyards Corp., 25 Broadway, New York City.

PULVERIZED COAL SYSTEMS
Fuller-Lehigh Co., Fullerton, Pa.
Todd Shipyards Corp., 25 Broadway, New York City.

PUMPS
Dean Brothers Co., 323 W. 10th St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above

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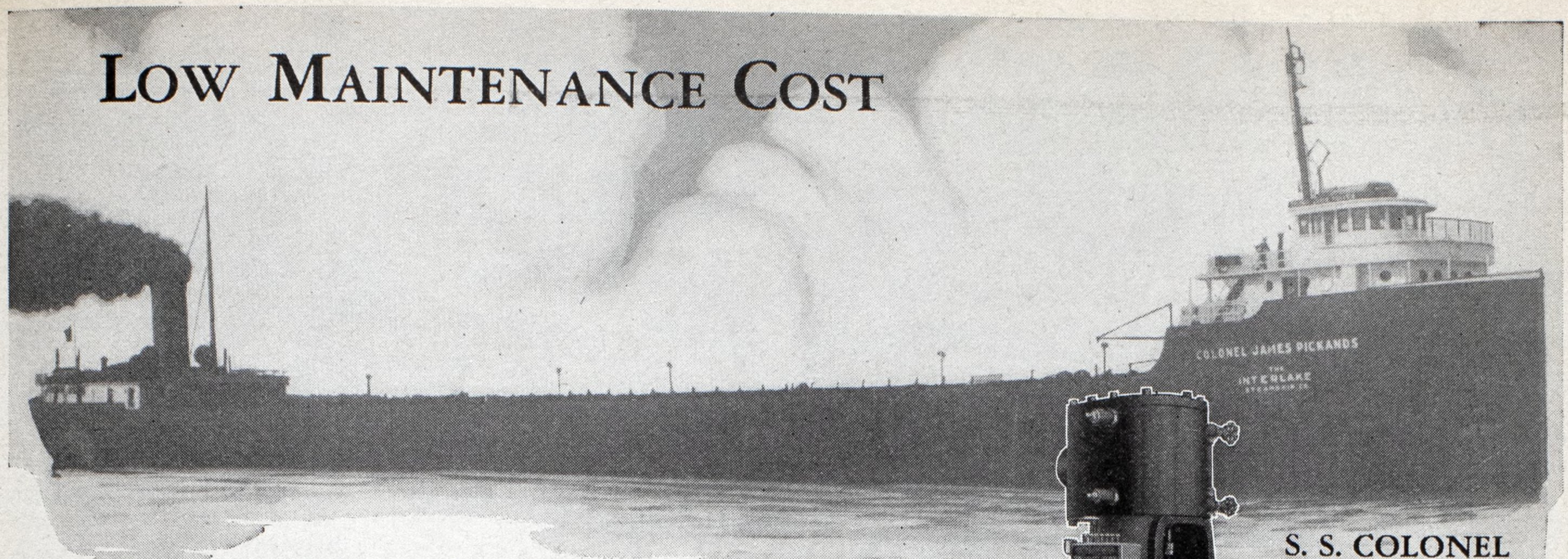

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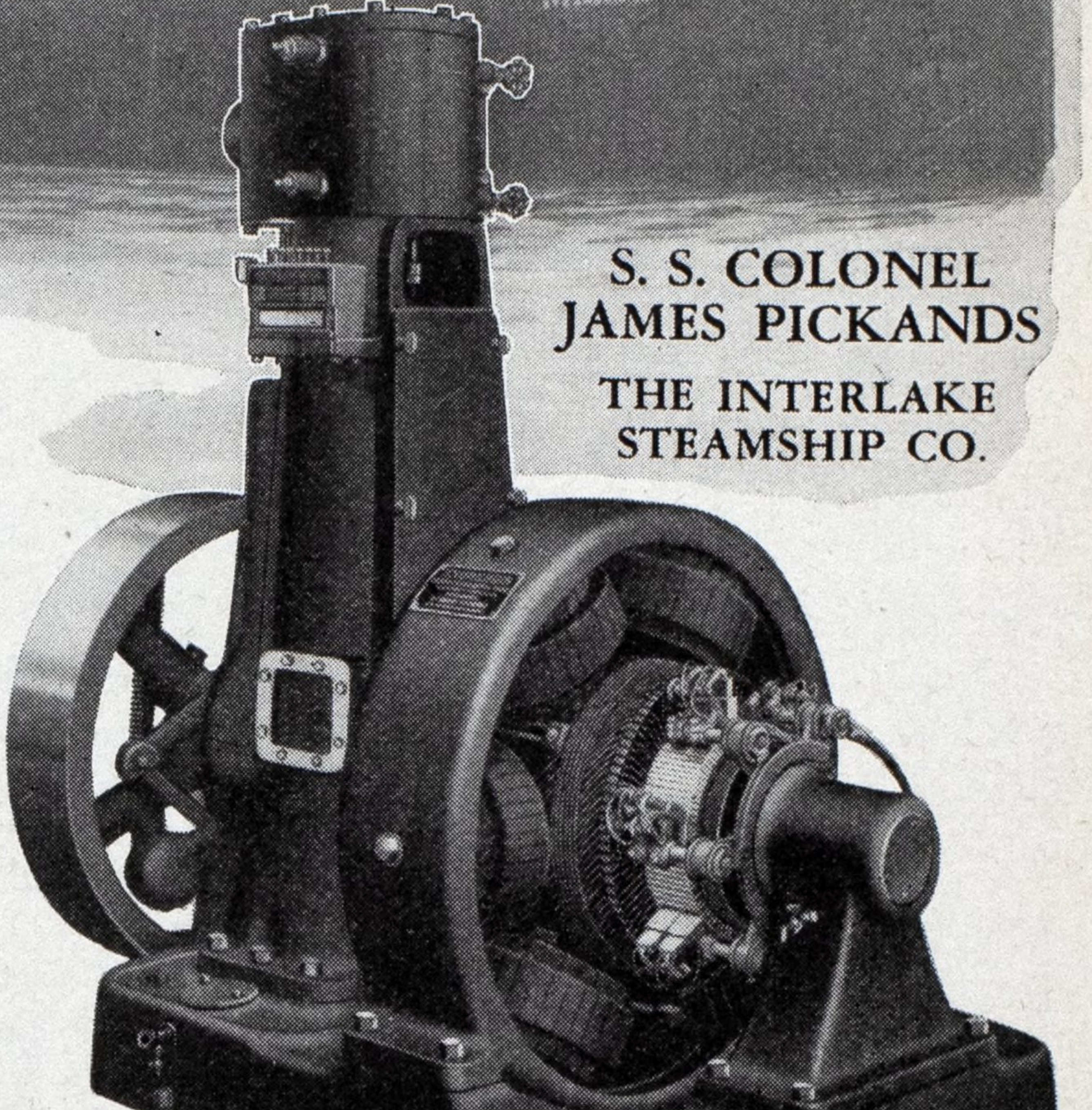

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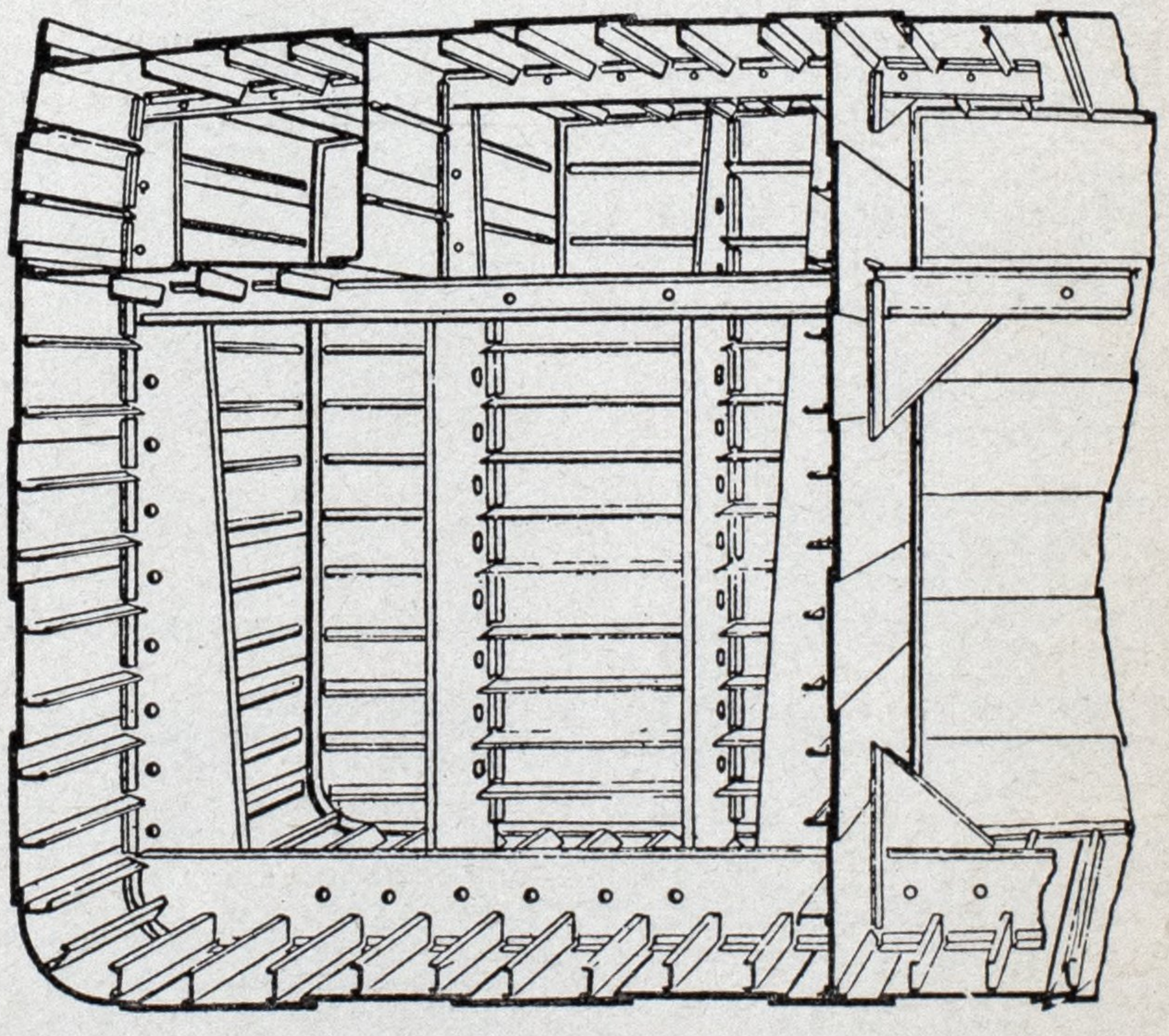

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Ingersoll-Rand Co., 11 Broadway, New York City.
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PUMPS (Ballast)
Dean Brothers Co., 323 W. 10th St., Indianapolis, Ind.
Warren Steam Pump Co., Inc., Warren, Mass.

PUMPS (Bilge)
Dean Brothers Co., 323 W. 10th St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
Warren Steam Pump Co., Inc., Warren, Mass.

PUMPS (Boiler Feed)
Dean Brothers Co., 323 W. 10th St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
Warren Steam Pump Co., Inc., Warren, Mass.

PUMPS (Direct Acting)
Dean Brothers Co., 323 W. 10th St., Indianapolis, Ind.

PUMPS (Fuel Oil)
Coen Co., Inc., 610 S. Broadway, Los Angeles, Cal.

PUMPS (Power)
Dean Brothers Co., 323 W. 10th St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.

PUMPS (Steam)
Dean Brothers Co., 323 W. 10th St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
Warren Steam Pump Co., Inc., Warren, Mass.

PUMPS (Vacuum)
Dean Brothers Co., 323 W. 10th St., Indianapolis, Ind.

PURIFICATION SYSTEMS—See WATER PURIFICATION SYSTEMS

PURIFIERS (Oil)
Sharples Specialty Co., Westmoreland, Philadelphia, Pa.

RADIO COMPASS AND DIRECTION FINDER
Radiomarine Corp. of America, 66 Broad St., New York City.

RADIO EQUIPMENT
Radiomarine Corp. of America, 66 Broad St., New York City.

RAFTS
Lane, C. M., Lifeboat Co., Inc., 856 Humboldt St., Brooklyn, N. Y.

RANGES
Stamford Foundry Co., Stamford, Conn.

REFRIGERATING MACHINERY
Brunswick-Kroeschell Co., New Brunswick, N. J.
Ingersoll-Rand Co., 11 Broadway, New York City

REPAIRS
Maryland Dry Dock Co., Baltimore, Md.

REPAIRS (Electric)
Westinghouse Electric & Mfg. Co., S. Philadelphia, Pa.

REPAIRS (Marine)
American Shipbuilding Co., Foot of W. 54th St., Cleveland.
Bath Iron Works Corp., Bath, Me.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Canada Steamship Lines, P. O. 2435, Montreal, Can.
Chicago Shipbuilding Co., So. Chicago, Ill.
Collingwood Shipyards, Inc., Collingwood, Ont., Canada.
Great Lakes Engineering Works, River Rouge, Mich.
Manitowoc Ship Building Corp., Manitowoc, Wis.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
New York Shipbuilding Co., Camden, N. J.
Sun Shipbuilding & Dry Dock Co., Chester, Pa.
Todd Shipyards Corp., 25 Broadway, New York City.
Toledo Shipbuilding Co., Toledo, O.
United Dry Docks, Inc., 11 Broadway, New York City

REPAIRS (Marine Engine)
Collingwood Shipyards, Inc., Collingwood, Ont., Canada.
Electric Boat Co.-New London Ship & Engine Works, 247 Park Ave., New York City.

REPAIRS (Turbine)
Westinghouse Electric & Mfg. Co., S. Philadelphia, Pa.

REVOLUTION COUNTERS
Cummings Machine Works, 255 Atlantic Ave., Boston, Mass.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn, N. Y.

ROPE (Manila, Net, Sisal, and Other Hard Fiber Cordage)
Columbian Rope Co., Auburn, N. Y.
Samson Cordage Works, Boston.
Whitlock Cordage Co., 46 South St., New York City.

ROPE (Transmission)
Columbian Rope Co., Auburn, N. Y.

ROPE OAKUM
Stratford, George, Oakum Co., Jersey City, N. J.

RUBBER TILE
Selby, Battersby & Co., 33rd & Arch Sts., Philadelphia.

RUST PREVENTATIVE (Oil)
Vacuum Oil Co., 61 Broadway, New York City.

SAFETY VALVES (Marine)
Star Brass Mfg. Co., 53 Oliver St., Boston, Mass.

SCHOONERS (Auxiliary)
American Shipbuilding Co., Foot of W. 54th St., Cleveland.
Toledo Shipbuilding Co., Toledo, O.

SEARCHLIGHTS (High Intensity)
Sperry Gyroscope Co., The, Brooklyn, N. Y.

SEARCHLIGHTS (Incandescent and Arc)
General Electric Co., Schenectady, N. Y.
Sperry Gyroscope Co., The, Brooklyn, N. Y.

SELF UNLOADING EQUIPMENT
Smith, Leathem D., Dock Co., Sturgeon Bay, Wis.

SEPARATORS (Oil)
Babcock & Wilcox Co., 85 Liberty St., New York City.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Sharples Specialty Co., Westmoreland, Philadelphia, Pa.

SHIPBUILDERS
American Shipbuilding Co., Foot of W. 54th St., Cleveland.
Bath Iron Works Corp., Bath, Me.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Canada Steamship Lines, P. O. Box 2430, Montreal, Can.
Collingwood Shipyards, Inc., Collingwood, Ont., Canada.
Great Lakes Engineering Works, River Rouge, Mich.
Manitowoc Ship Building Corp., Manitowoc, Wis.
Maryland Dry Dock Co., Baltimore, Md.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
New York Shipbuilding Co., Camden, N. J.
Smith, Leathem D., Dock Co., Sturgeon Bay, Wis.
Sun Shipbuilding & Dry Dock Co., Chester, Pa.
Todd Shipyards Corp., 25 Broadway, New York City.
Toledo Shipbuilding Co., Toledo, O.
United Dry Docks, Inc., 11 Broadway, New York City.

SHIPBUILDING SYSTEMS
Isherwood, J. W., & Co., Ltd., 17 Battery Place, New York City.

SHIP STABILIZERS
Sperry Gyroscope Co., The, Brooklyn, N. Y.

SIGNALS (Submarine)
Submarine Signal Co., 160 State St., Boston, Mass.

SOUNDING MACHINES
Submarine Signal Co., 160 State St., Boston, Mass.

SPRINGS (Box, Bed)
Simmons Co., The, 666 Lake Shore Drive, Chicago, Ill.

SPUN OAKUM
Stratford, George, Oakum Co., Jersey City, N. J.

STEAMSHIP LINES (Passenger and Freight)
Hamburg-American Lines, 39 Broadway, New York City.

STEAM GAGES
Star Brass Mfg. Co., 53 Oliver St., Boston, Mass.

STEAM TRAPS
Davis Engineering Co., 90 West St., New York City.

STEEL BARGES—See BARGES (Steel)

STEEL TANKS
Brunswick-Kroeschell Co., New Brunswick, N. J.

STEERING ENGINES
Hyde Windlass Co., Bath, Me.

STEERING GEARS
American Engineering Co. Cumberland & Aramingo Sts., Philadelphia, Pa.
American Shipbuilding Co., Foot of W. 54th St., Cleveland.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Hyde Windlass Co., Bath, Me.

STOKERS
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

STORAGE BATTERIES—See BATTERIES

STOVES
Stamford Foundry Co., Stamford, Conn.

STRAINERS (Oil)
Coen Co., Inc., 610 S. Broadway, Los Angeles, Cal.

SUPERHEATERS
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

SWITCHBOARDS
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., S. Philadelphia, Pa.

TELEMOTORS
Hyde Windlass Co., Bath, Me.

TELEMOTORS (Hydraulic and Electric)
American Engineering Co., Cumberland & Aramingo Sts., Philadelphia, Pa.

TORSION METERS
Cummings Machine Works, 255 Atlantic Ave., Boston, Mass.

TOWING
Moran Towing & Transportation Co. 17 Battery Place, New York City.

TOWING LINES
Columbian Rope Co., Auburn, N. Y.
Whitlock Cordage Co., 46 South St., New York City.

TOWING & MOORING ENGINES
American Engineering Co., Cumberland & Aramingo Sts., Philadelphia, Pa.

TRACTORS
Clark Tructractor Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4205 St. Clair Ave., Cleveland, O.

TRANSMISSION (Rope)—See ROPE (Transmission)

TREADS (Safety)
Dravo Contracting Co., Neville Island, Pittsburgh, Pa.

TRUCKS
Clark Tructractor Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4205 St. Clair Ave., Cleveland, O.

TRUCKS (Dump)
Clark Tructractor Co., Battle Creek, Mich.

TURBINES (Electric)
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

TURBINES (Marine)
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

TURBINES (Steam)
DeLaval Steam Turbine Co., Trenton, N. J.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

TWINE AND ROPE
Columbian Rope Co., Auburn, N. Y.
Samson Cordage Works, Boston.
Whitlock Cordage Co., 46 South St., New York City.

VENTILATING EQUIPMENT
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VENTILATORS
Allen Corp., 1040 14th St., Detroit, Mich.

WATER PURIFICATION SYSTEMS
Griscom-Russell Co., 285 Madison Ave., New York City.

WELDERS (Electric Arc)
Westinghouse Electric & Mfg. Co., S. Philadelphia, Pa.

WELDING & CUTTING APPARATUS (Oxy, Acetylene, Oxy-Gas)
Oxweld Acetylene Co., The, 30 E. 42nd St., New York City

WELDING GAS
Prestolite Co., The, Inc., 30 E. 42nd St., New York City

WELDING SUPPLIES
Oxweld Acetylene Co., The, 30 E. 42nd St., New York City

WHISTLES
Star Brass Mfg. Co., 53 Oliver St., Boston, Mass

WINCHES
American Engineering Co., Cumberland & Aramingo Sts., Philadelphia, Pa.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Dake Engine Co., Grand Haven, Mich.
Hyde Windlass Co., Bath, Me.

WINDLASSES
American Shipbuilding Co., Foot of W. 54th St., Cleveland.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Dake Engine Co., Grand Haven, Mich.
Hyde Windlass Co., Bath, Me.

WIRELESS MESSAGE SERVICE
Radiomarine Corp. of America, 66 Broad St., New York City.

WIRELESS SETS AND APPARATUS
Radiomarine Corp. of America, 66 Broad St., New York City.

WORKBOATS
Lane, C. M., Lifeboat Co., Inc., 856 Humboldt St., Brooklyn.

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Magpetco
Sabine
Galveston
Port Arthur

Pacific Coast
San Francisco
Richmond
San Pedro
San Diego
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Portland
Point Wells
Aberdeen
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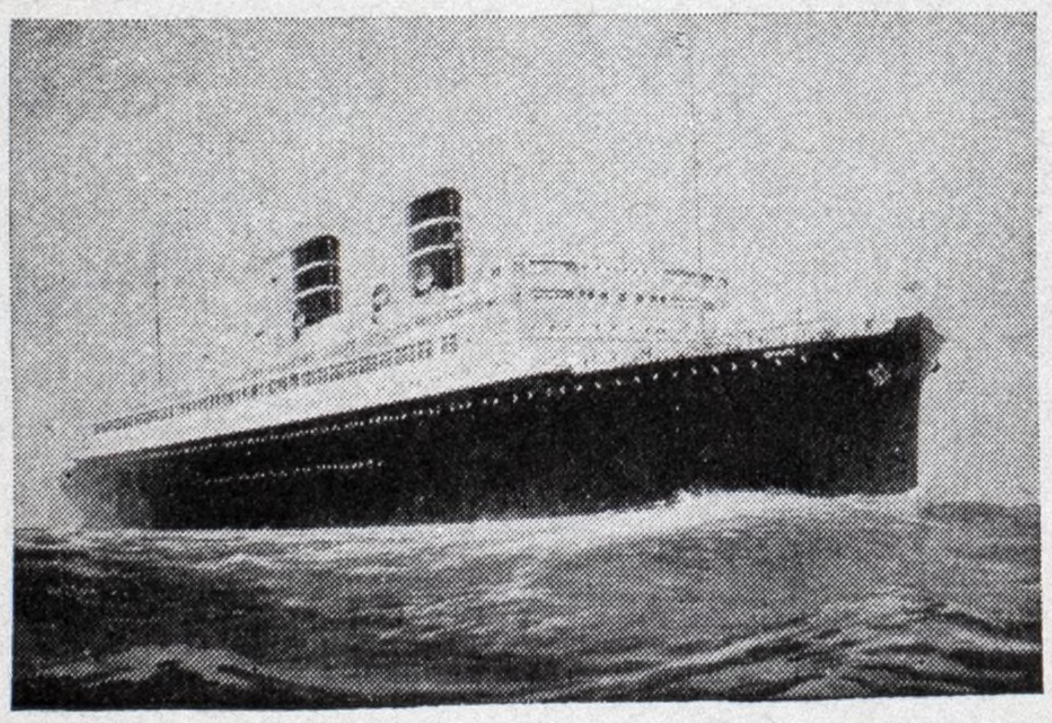

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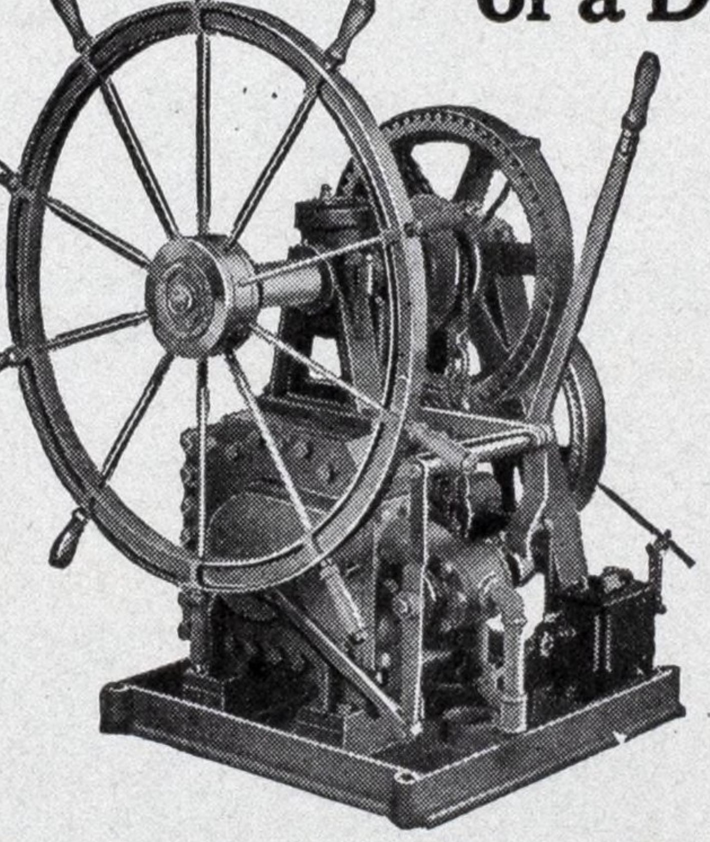

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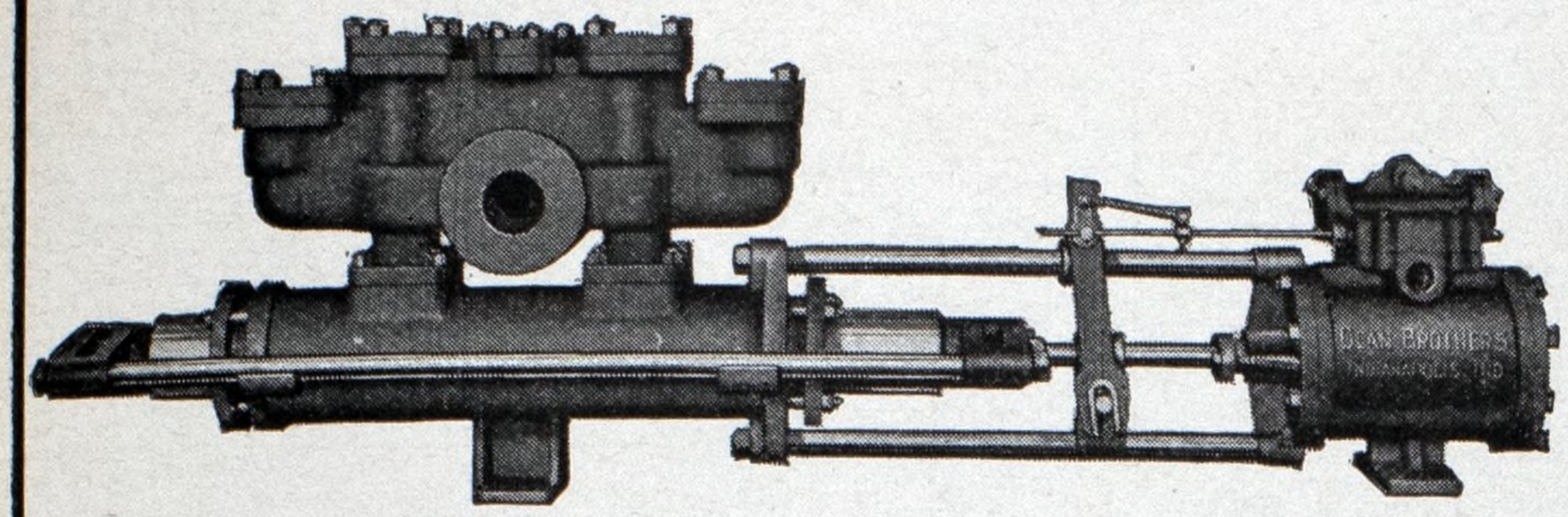

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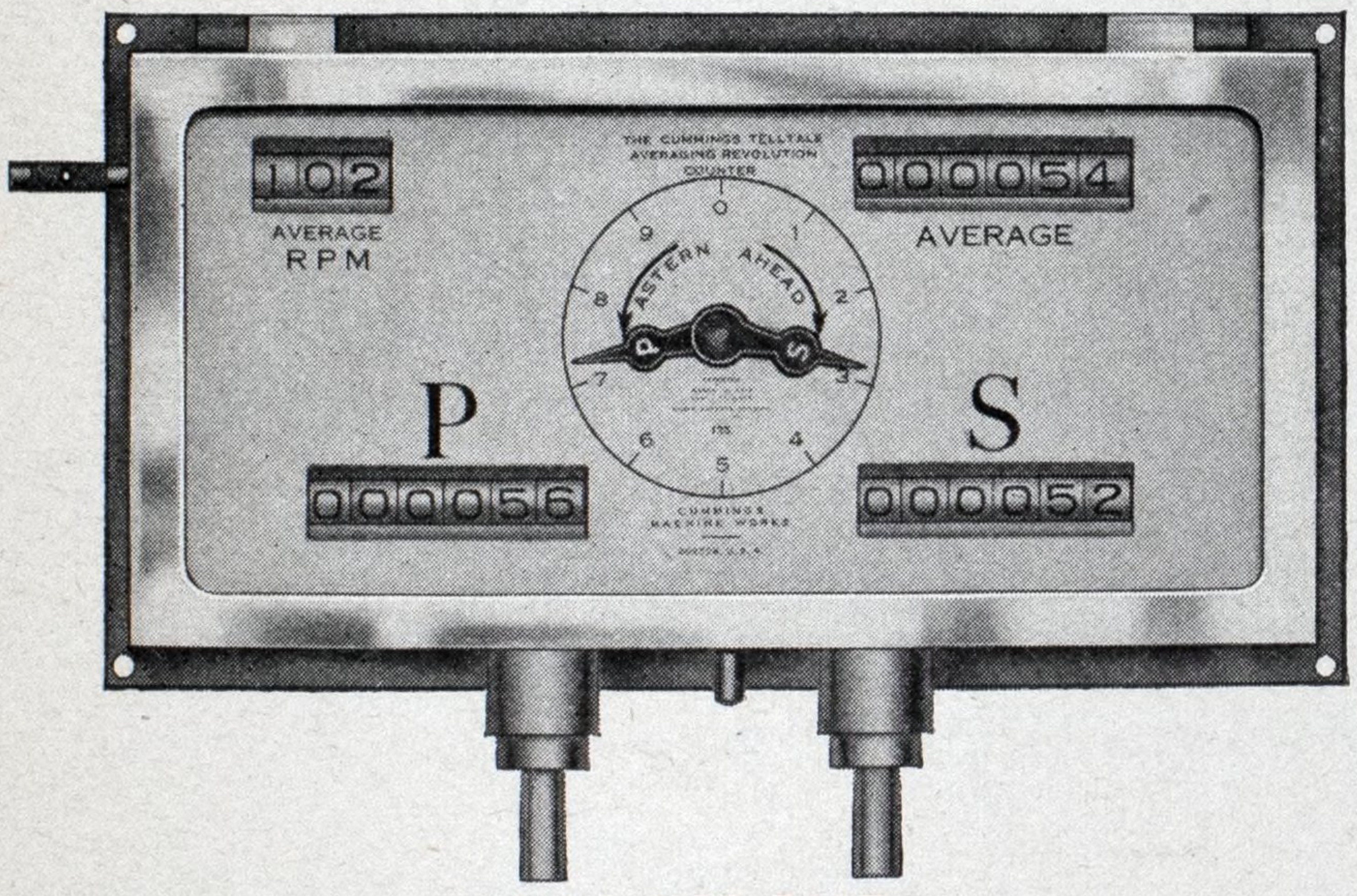

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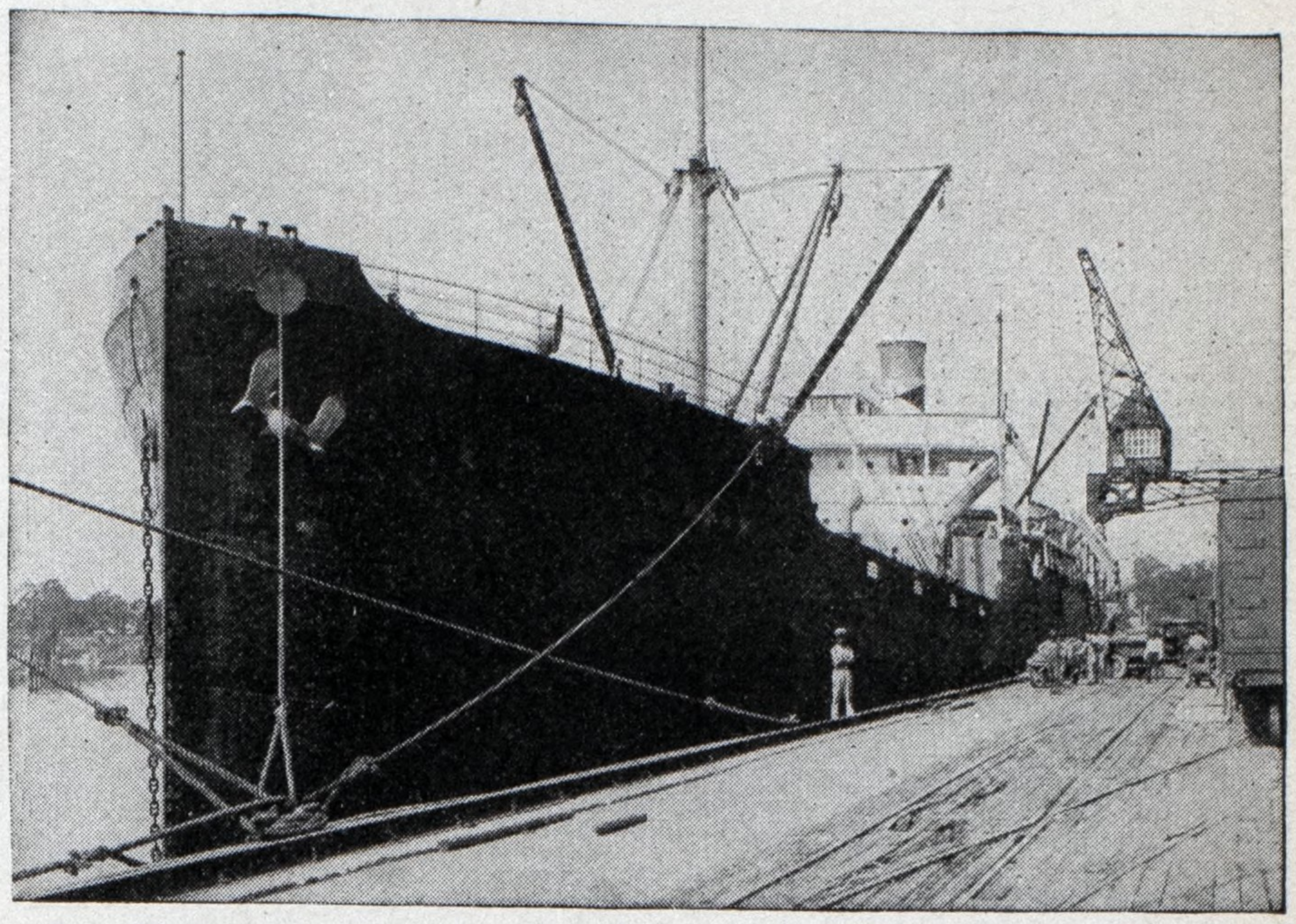

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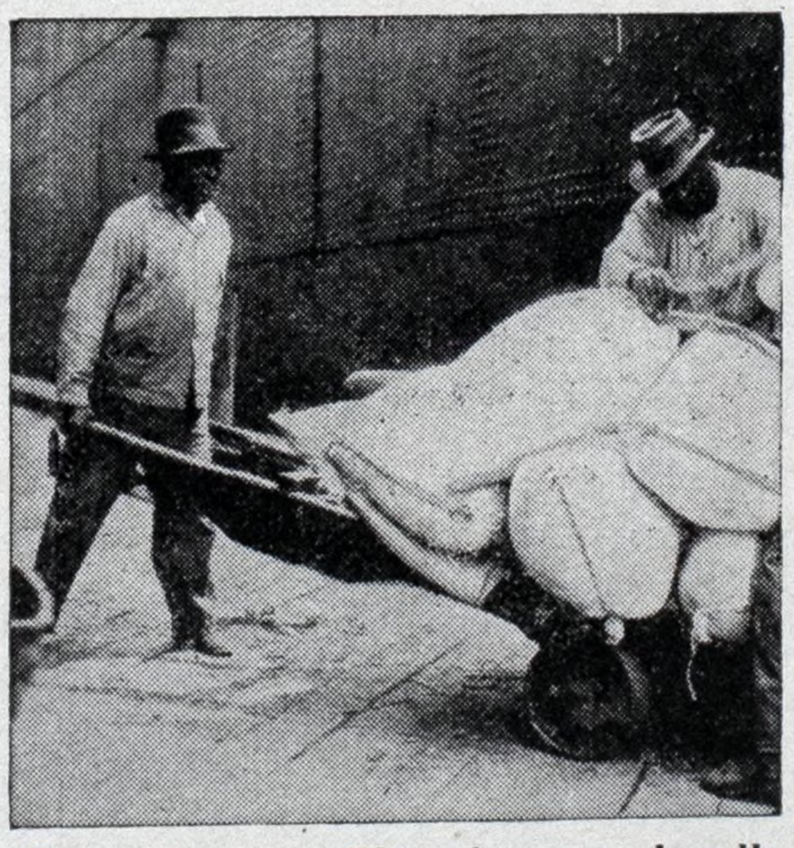

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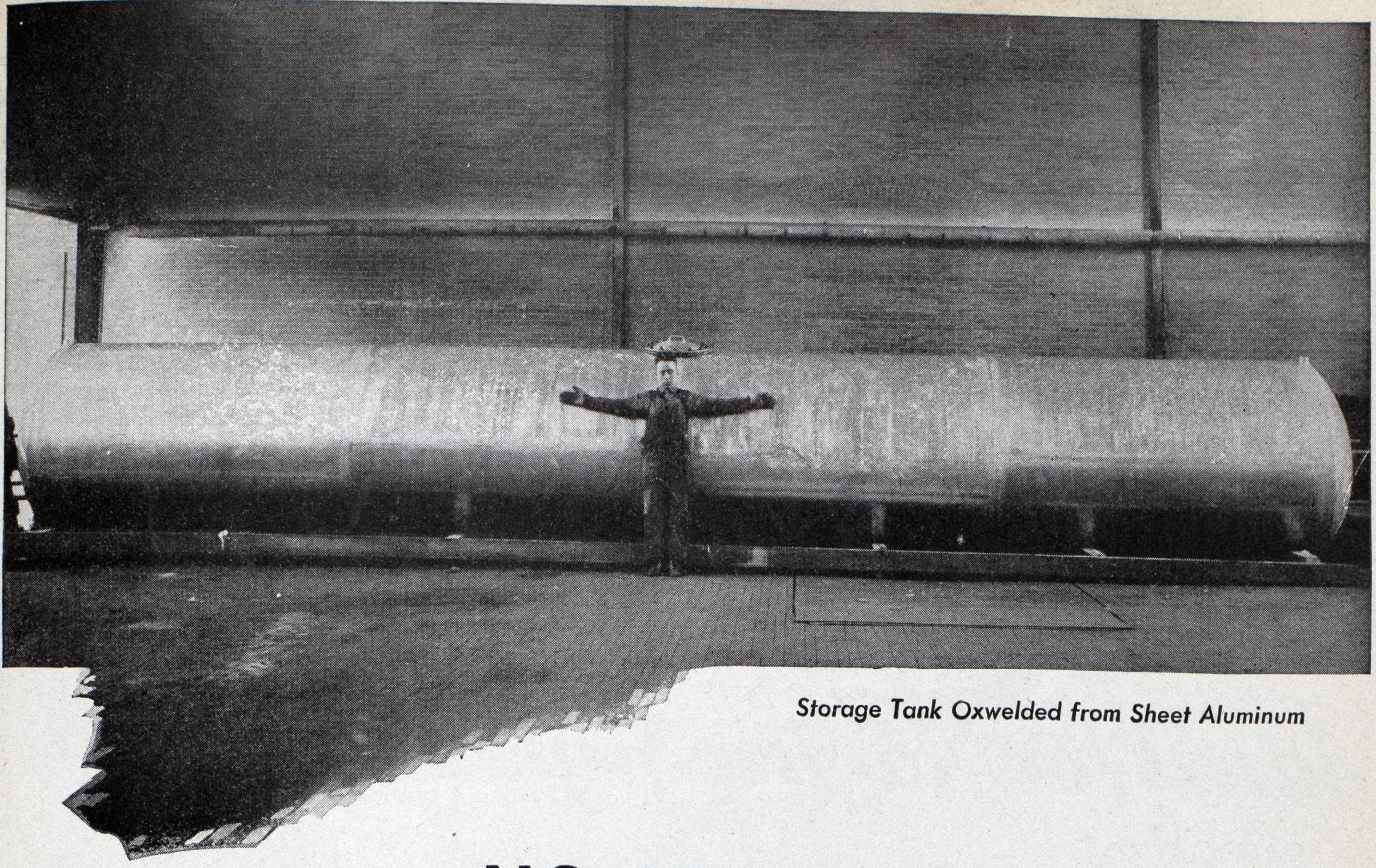

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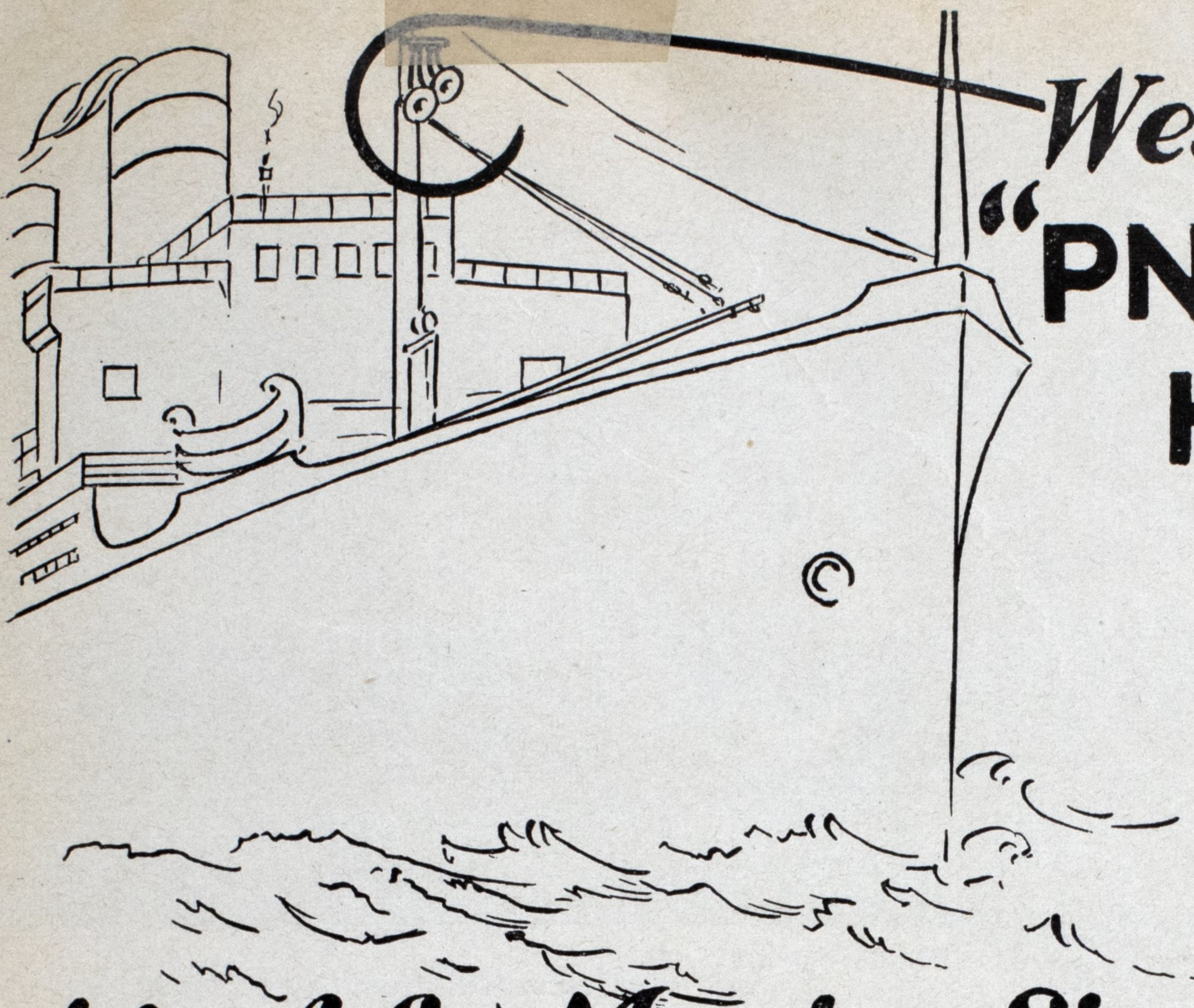

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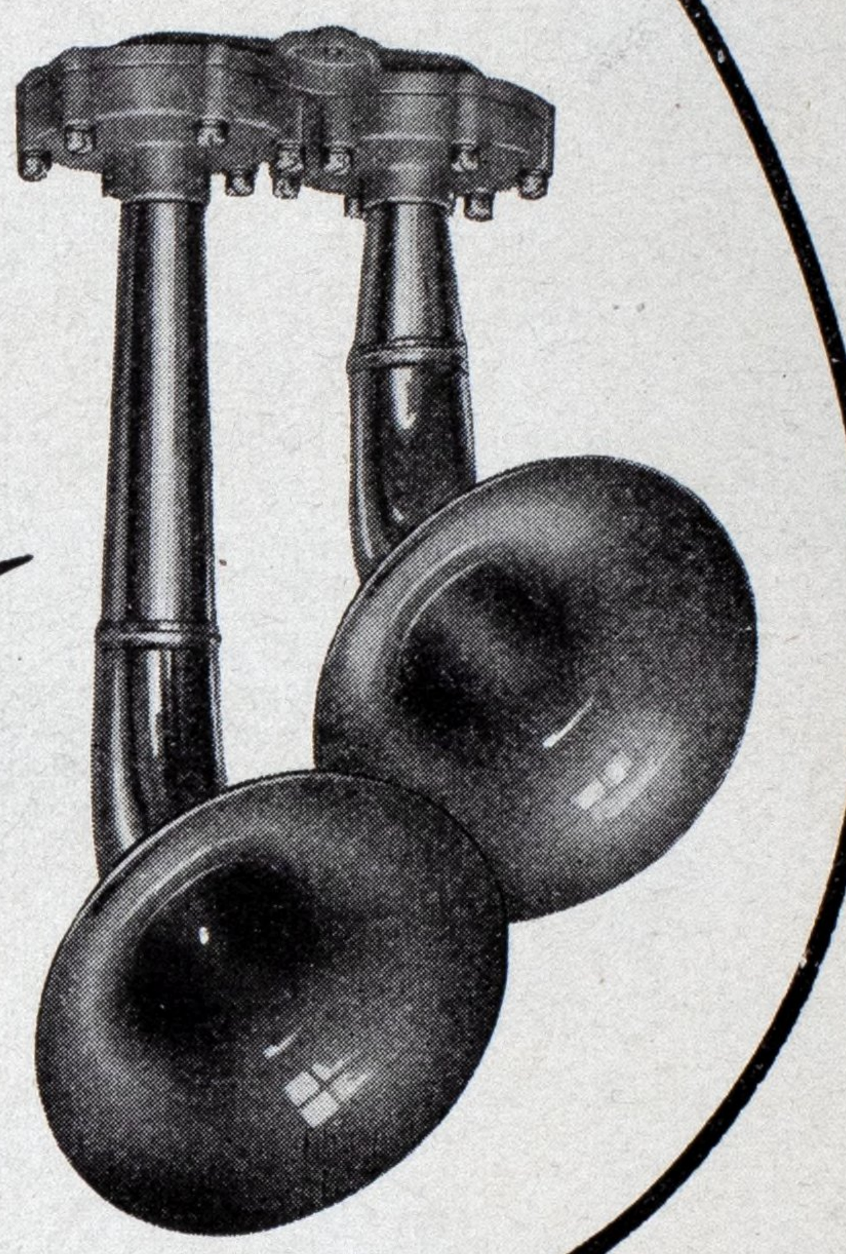

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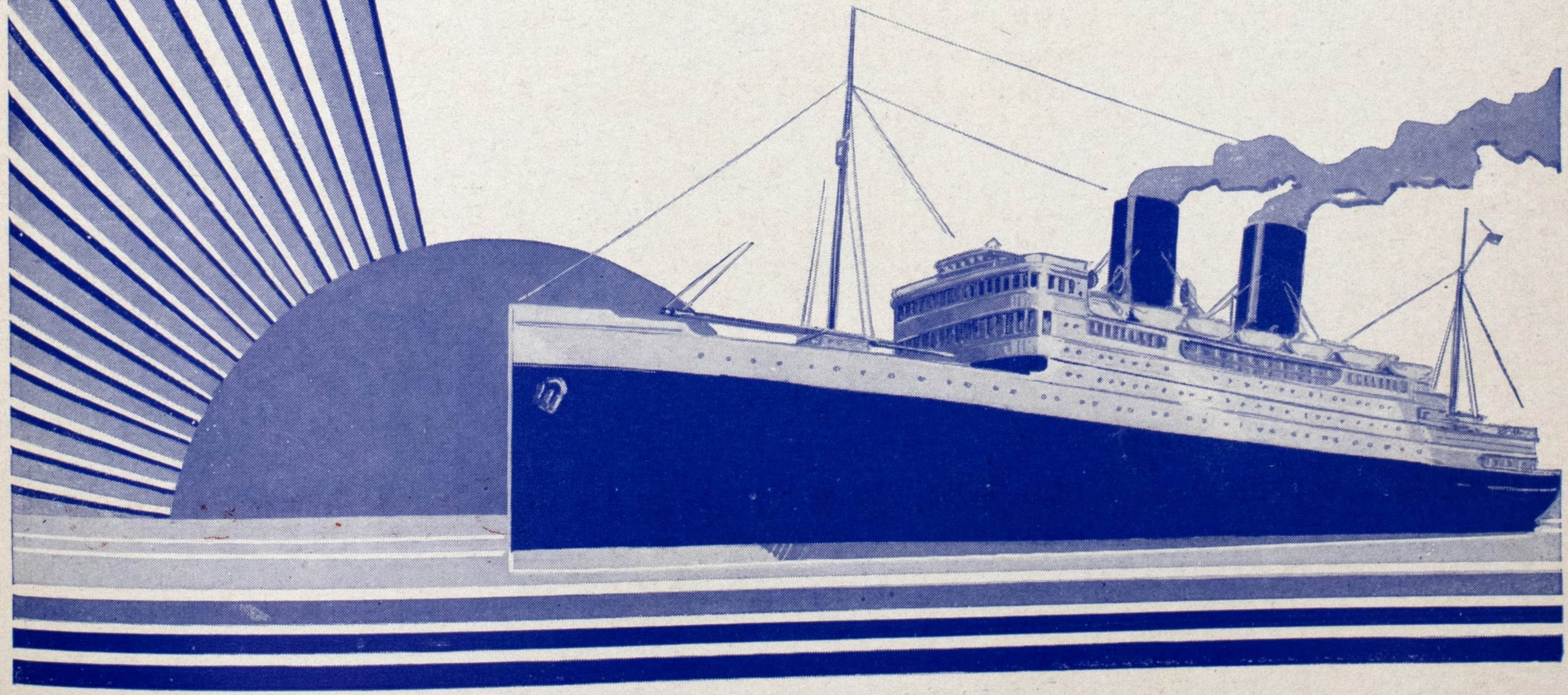

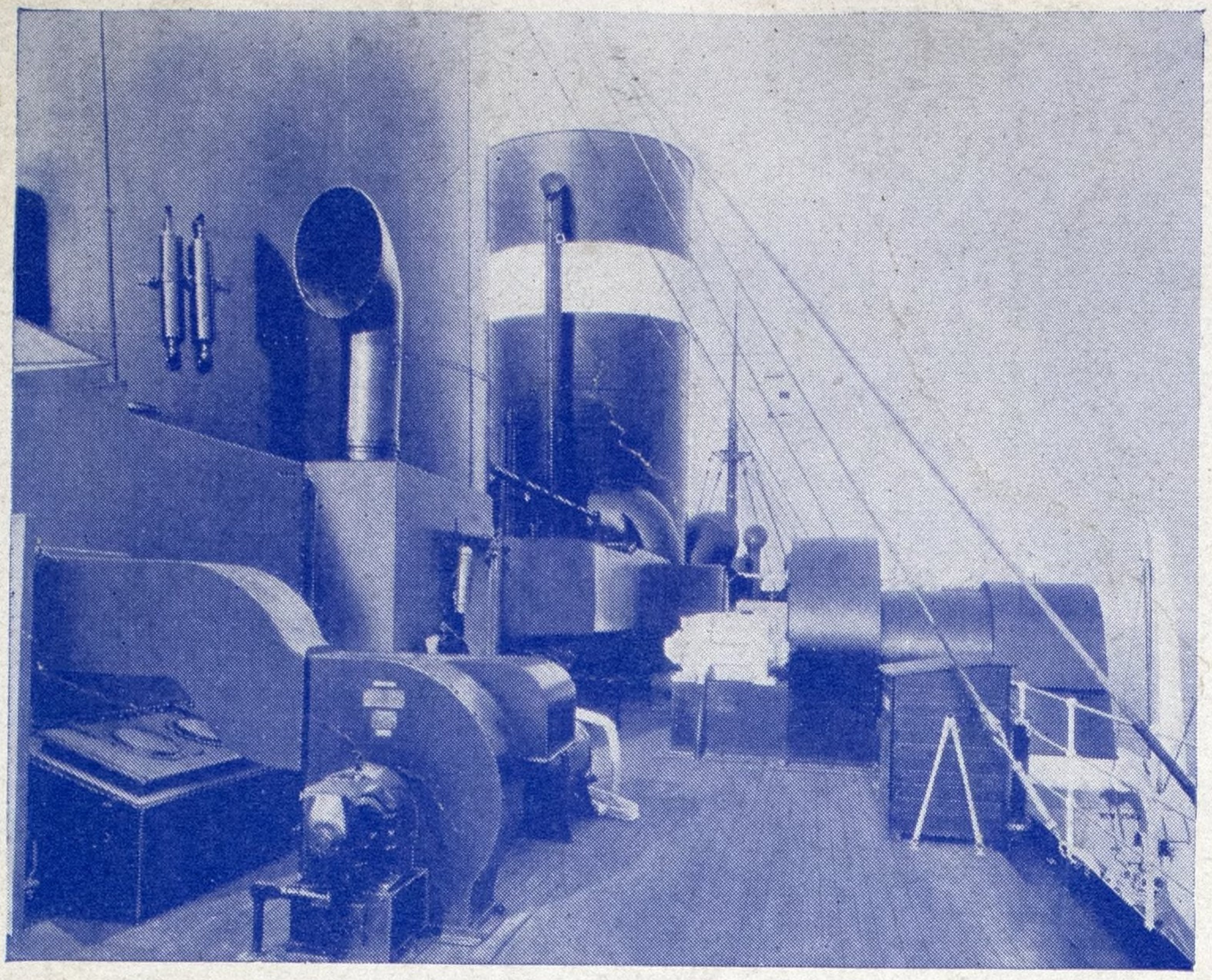

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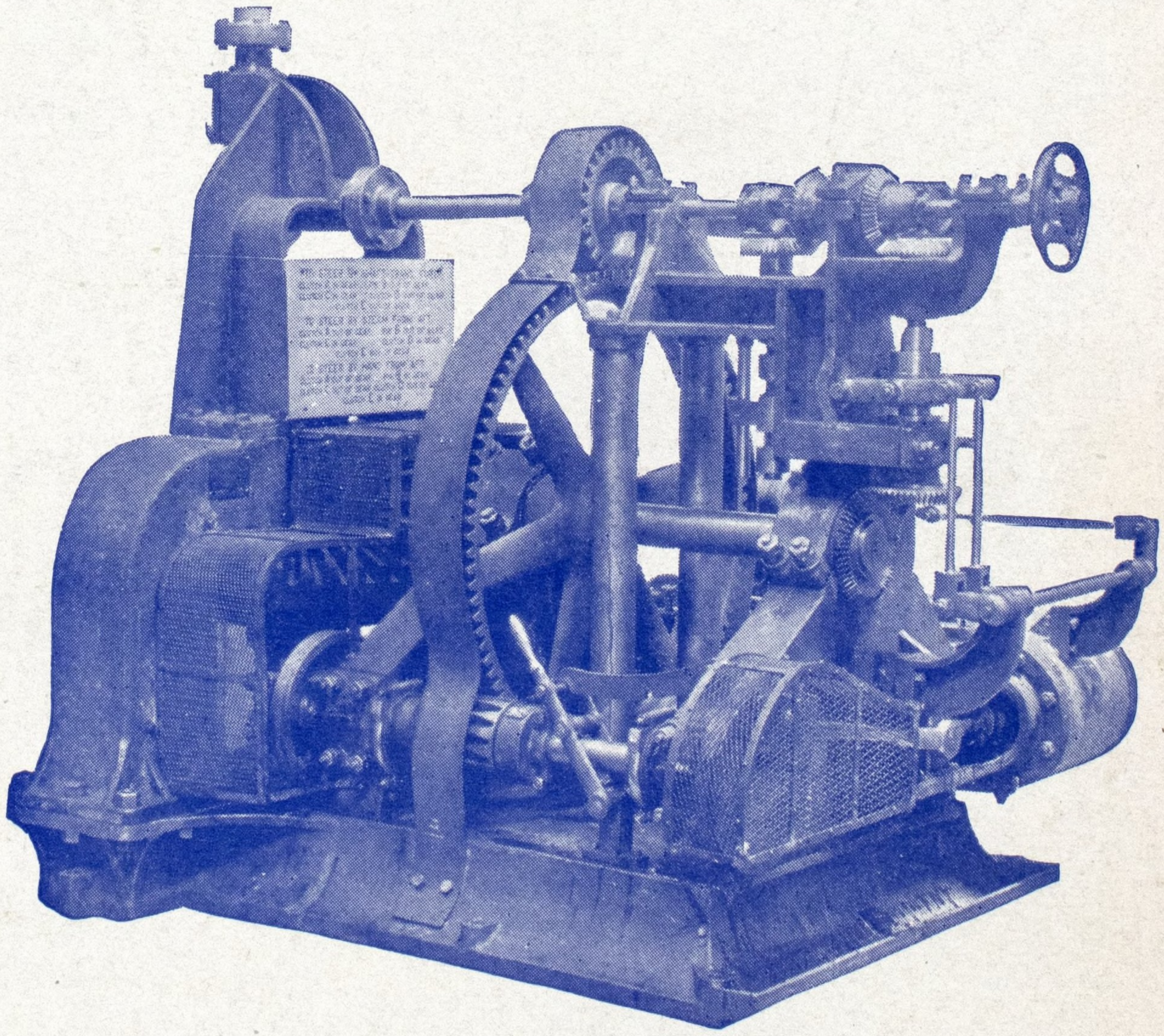

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